



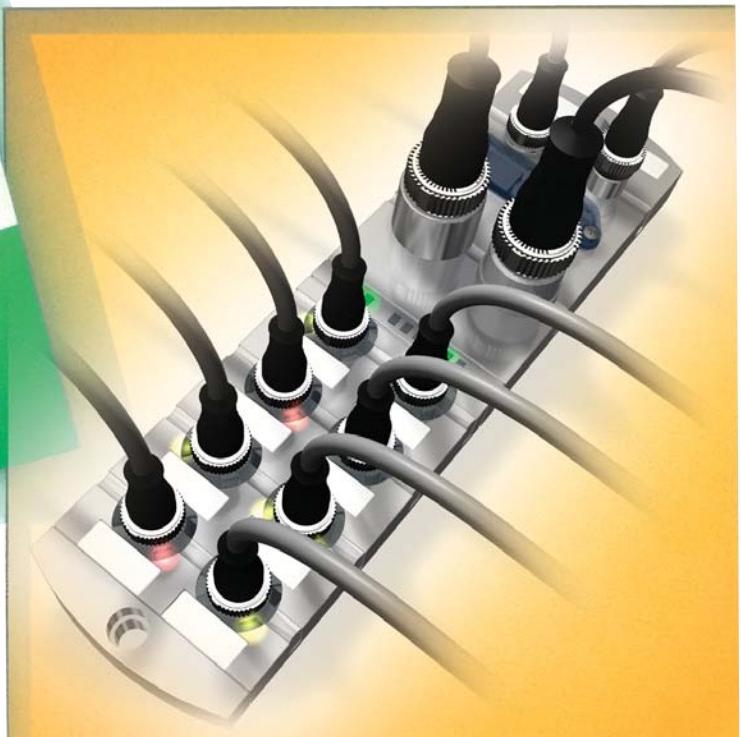
Handbuch
Manual
Manuel

MVK-MC

Art.-No. 55304

Art.-No. 55305

Art.-No. 55306





User's Manual

MVK-MC Series

Article No. 55 304 MVK-MC DI8 (DI8)
(MVK-MC DI8 + 8x Diagnosis/DI)

Article No. 55 305 MVK-MC DIO8 (DI8)
(MVK-MC DIO8 + 8x Diagnosis/DI)

Article No. 55 306 MVK-MC DIO8 (DIO8)
(MVK-MC DIO8 + 8x Diagnosis/DI/DO)

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Additions / corrections to the manual

Version	Chapter	Additions/Corrections	Date/Name
V0.0		Initial version	27.02.04 / ERW
V0.1	7.4.18, 7.4.20	Static PDO mapping parameters remark deleted	26.03.04 / ERW
V1.0		Update in accordance with German version V1.0 (55388_hdb_d_10)	03.08.04 / THF
V1.1	7.4.14	Update in accordance with German version V1.1 (55388_hdb_d_10) Object 1017H (new figure) + Legal Provisions	02.03.2010 ri/us

Notes:

1 Concerning this manual

The text, illustrations, diagrams and examples used in this manual serve solely for the purpose of explanation, operation and usage of Input/Output modules of the MVK-MC series.

If you should have any further reaching questions regarding the installation and set-up of the equipment described in this manual, please don't hesitate to contact us. We would be glad to assist you any time.

Murrelektronik reserves the right to make technical changes or modifications to this manual without prior notice.

1.1 A guide through the manual

The "Safety information" section must be read without fail **prior** to working with the products and the system. This section contains information required for safe installation and handling.

The "Configuration information" section describes the MVK-MC module in terms of system and component specifications. This chapter addresses itself to the system planner and offers information on important details relevant to successful configuration.

The "Installation information" section provides details regarding installation, in both mechanical and electrical contexts. This chapter addresses itself in particular to qualified and trained electricians responsible for the assembly and installation of system components.

The "Diagnosis" and "Set-up" sections direct themselves to the set-up personnel. This section offers important information with regard to the rapid and uncomplicated set-up of individual modules as well as the complete system.

2 Safety information

2.1 Designated use

The input and output modules of the MVK-MC series are designated for use only in those areas as described in this manual.

Strict adherence to the data specified in this manual must be ensured. The products have been developed, manufactured, tested and documented in compliance with currently valid safety codes.

The equipment poses no danger to operating personnel or material if configuration, assembly, and operation are performed in compliance with the stated handling and safety regulations.

Unqualified intervention in the hardware and software of our equipment, disregard of warning labels found on the equipment or non-observance of the information in this manual can result in injury or serious damage to man and/or material.

Only supplementary or extension devices that have been recommended by Murrelektronik may be employed in conjunction with products of the MVK-MC series.

Any application or usage beyond and above this shall be regarded as non-designated.

**Warning!**

Good chemical and oil resistance. When using aggressive mediums, material resistance based on application must be checked.

2.2 Target groups

This manual addresses itself exclusively to qualified and trained electricians knowledgeable in the safety standards of automation technology.

Only a qualified, trained electrical tradesman knowledgeable in the safety standards of automation technology may perform configuration, installation, set-up, maintenance and testing of the equipment.

Only Murrelektronik technical personnel are allowed to undertake intervention in the hardware and software of our equipment, insomuch as this is not described in this manual.

2.3 Regulations

Current safety and accident prevention laws valid for a specific application must be observed in the configuration, installation, setup, maintenance and testing of the equipment.

2.3.1 EU directives



This equipment fulfills the requirements of EC directive 89/336/EEC
"Electromagnetic compatibility"

There are no restrictions to applications in residential, business and industrial areas, including industrial facilities large and small.

2.3.2 Electrical safety

All devices connected to this equipment must fulfill EN 61558-2-4 and EN 61558-2-6 requirements.

2.3.3 General information

- a) The designated function of this equipment is guaranteed only if the conditions for installation, system extension, operation and maintenance are complied with.
- b) Only system extensions and cables are allowed that meet the requirements and regulations for safety, electromagnetic compatibility and, where applicable, telecommunications transmission equipment and specifications.
The installation of other extensions may violate these requirements and regulations or damage the equipment.
Information concerning the type of authorized system extensions and cables can be obtained from your Murrelektronik distributor or taken from this manual.
- c) The designated operation of the equipment is guaranteed only with the housing fully installed.
- d) This product is designed and manufactured to assure protection against damage and hazards if designated usage and proper maintenance are observed.

2.4 Information regarding standards

2.4.1 Equipment standards

- EN 50325-1 Industrial communication sub-system, based on ISO 11898 (CAN)
Part 1: General requirements.
- EN 60 947-1 Low voltage switchgear
Part1: General conventions
- EN 60 947-5-2 Low voltage switchgear
Part 5-2: Control units and switch elements – proximity switches
- IEC 62026-1 Low voltage switchgear and control devices - Controller device interfaces
Part1: General conventions.

2.4.2 CiA standards

- DS301 V4.01 CANopen Application Layer and Communication Profile
- DS401 V2.0 CANopen Device Profile for Generic I/O Modules
- DS102 V2.0 CAN Physical Layer for Industrial Applications
- DR303-1 V1.0 CANopen Cabling and Connector Pin Assignment
- DRP303-3 V0.1 CANopen Indicator Specification
- DSP306 V1.0 CANopen Electronic Data Sheet Specification for CANopen

2.4.3 EMC standards

- EN 55 011 Industrial, scientific and medical high frequency equipment – Radio interference – Limit values and sensing methods.
- EN 50081-1 EMC Part1: Residential areas, business and industrial areas, including large and small facilities
Main section 1:
EMC Part 4: Testing and sensing methods
- EN 61 000-4-2 Main section 2:
Test of immunity to static electrical discharge
– EMC basic standards
- EN 61 000-4-3 EMC Part 4: Testing and sensing methods
Main section 3:
Test of immunity to RF electromagnetic fields.
- EN 61 000-4-4 EMC Part 4: Testing and sensing methods
Main section 4:
Test of immunity to rapid transient disturbances/burst - EMC basic standard.
- EN 61 000-4-6 EMC Part 4: Testing and sensing methods
Main section 6:
Test of immunity to asymmetric RF input - EMC basic standard.

2.4.4 Safety standards

- EN 60 947-1 Low voltage switchgear
Part 1: General conventions
- EN 60 529 Type of housing protection (IP-Code)
- VDE 0100 Part 410/HD 384.4.41 Installation of power systems and equipment with nominal voltages up to 1,000 V
Part 4: Protective measures
- Chapter 41: Protection against electrical shocks

2.4.5 Mechanical ambient conditions

- EN 60068-2-6 Environment test, sine-shaped oscillation
- EN 60068-2-27 Environment test, shocks

2.5 Explanation of symbols

2.5.1 Use of attention signs

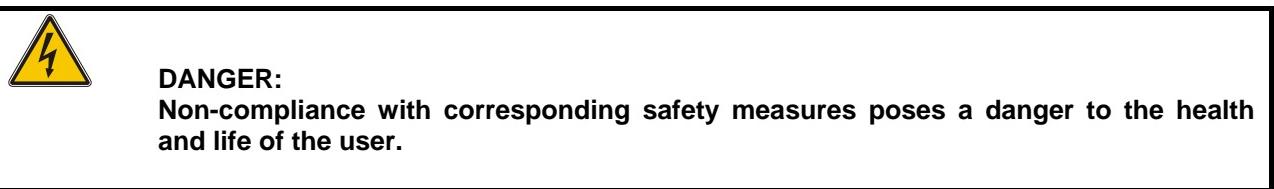
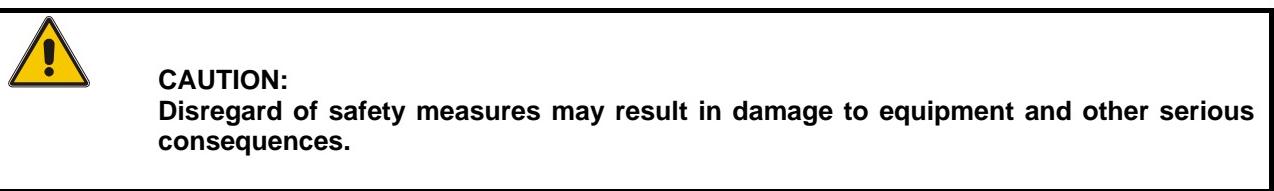
Notes containing important information are specially marked. These are illustrated as follows:



Attention text.....

2.5.2 Use of danger signs

Danger signs are additionally marked with an enclosing frame.



2.5.3 Use of numbering in illustrations

Illustrations are numbered with white numbers on a black, round field.

- Example:
- ① Text 1.....
 - ② Text 2.....
 - ③ Text 3.....

The explanatory text follows in tabular form under the same number, in direct context to the preceding illustration.

2.5.4 Use of handling information

Handling information describes the sequence of steps during installation, setup, operation and maintenance that must be strictly observed.

The numbering (black numerals in a white field) is given in a sequential and ascending order.
Example:

- ① Instruction 1.....
- ② Instruction 2.....
- ③ Instruction 3.....
- ④ Instruction 4.....

2.5.5 Use of foot notes

Supplementary information is marked with superscripted numerals (example: Text Text¹⁾ Text Text). These are explained in the form of footnotes beneath tables or text at the end of the page.

3 Configuration information

3.1 CAN-Bus protocol description

CAN (Controller Area Network) was originally developed only for information exchange within a motor vehicle. The gear change operation, for example, was to be improved by having the transmission inform the engine management of a gear change request via CAN. The CAN system was therefore conceived to transmit short messages under real time conditions. This is also a typical task of machine controls in automation technology.

The textile machine industry was amongst the CAN pioneers. Back in 1990 already, a manufacturer equipped his weaving machines with modular control systems that communicate through the CAN network. Since then, numerous textile machine manufacturers have joined in a "CAN Textile Users Group". This group in turn is a member of the international "CAN in Automation" (CiA) user and manufacturers association.

In the USA, a number of corporations employ CAN in their production systems and machine tools as a system-internal or machine-internal bus system to interconnect sensors and actuators. Such manufacturers include Honeywell, Allen-Bradley, Coca-Cola and United Parcel Services. Some users, for example in medical technology, have opted for CAN because of the extremely high safety requirements they must meet in their field. Manufacturers of safety-sensitive or high-availability machines and systems (e.g. robots and transport systems) have similar problems to solve.

The extremely interesting technical characteristics of CAN, coupled with its low price (due to the volume of units used in the automotive industry), have made CAN a worldwide-accepted bus system in automation technology. In the CAN system, equal rights users (control devices, sensors and actuators) are connected to each other by means of a serial bus. The bus cable itself is a symmetric or asymmetric two-wire cable that is either screened or non-screened, depending on the requirements. The electrical parameters of physical transmission are defined in ISO 11898.

CAN is distinctive for its immunity to high temperatures and interference fields. Another of its distinguishing features is its highly robust network performance (hamming distance = 6). Low device connection costs, in addition to high transmission speeds, are often a decisive argument in favour of CAN. The availability of CAN chips from different manufacturers is also decisive for price critical applications. All are naturally compatible with the specifications and OSI standards layers 1 and 2. Not the least of arguments in its favour is the compactness of the controller chips e.g. in the area of low voltage switchgear.

In CAN data transfer, no stations are addressed but messages. These "addresses", also referred to as identifiers, are marked by a network-wide unique identifier. In addition to marking the content, the identifier also establishes message priority. This is essential for bus assignment when several stations compete for access rights.

To be able to process all transmission requests in a CAN network while complying with latency conditions at possibly low data rates, the CAN protocol must implement a bus assignment method (arbitration). This method guarantees that simultaneous bus access by several stations always leads to defined bus assignment. Through bit-wise arbitration based on the identifiers of to-be-transferred messages, collision between several transmission-ready stations is clearly resolved, at the latest after 13 (standard format) or 33 bit times (expanded format) of any random time bus access. Unlike message-based arbitration according to the CSMA/CD method, this destruction-free collision resolving method guarantees that no bus capacity is required without user information actually being transferred.

Linking bus access priority to message content has proven itself advantageous in bus overload situations, as compared to the existing CSMA/CD or token method: Despite the low bus transport capacity, all pending transfer requests are processed in the sequence of importance for the total system (according to message priority).

High system and configuration flexibility is achieved, thanks to the above-described content-related method of addressing. Stations can be easily integrated into the existing CAN network without the need for software or hardware changes to the existing stations, if the new stations are solely recipients. As the data transfer protocol does not stipulate any physical target addresses for individual components, the concept of modular electronics is supported, as well as the possibility of multi-reception (Broad/multi-cast) and the synchronization of distributed processes.

3.2 CANopen protocol description

In the realization of CAN-based distributed systems, one is rapidly confronted with requirements not yet considered by layer 1 and layer 2 protocols. The starting point for CAL (CAN Application Layer) specifications was to provide a communication capability suitable for distributed systems, in the form of a user layer (layer 7) based on layer 2 protocol expanded communication capability.

CANopen originated from a sub-entity of CAL. Through the definition of profiles; it is even more specifically tailored for use in standard industrial components. CANopen is a CiA standard (CAN In Automation) and has already found wide acceptance shortly after its introduction. In Europe, CANopen can be regarded as the decisive standard for realization of CAN-based industrial system solutions.

The CANopen profile family is based on a so-called "Communication profile" which specifies the underlying communication mechanisms and their description (DS301).

The most important device types being used in industrial automation technology, such as digital and analog I/O modules (DS401), drives (DS402), operating devices (DSP403), regulators (DSP404), programmable controllers (DS405), encoders (DS406), are described in so-called "Device profiles". The device profiles define the functionality of standard devices of that particular type. The configurability of devices via the CAN bus serves as the basis for the manufacturer independence that the profile family aspires to provide.

CANopen is a collection of profiles for CAN based systems with the following characteristics:

- Open
- Real time data transfer without protocol overhead,
- Modular and scalable
- Devices are inter-operable and interchangeable
- Supported by many international manufacturers
- Standardized network configuration
- Access to all device parameters
- Synchronization and
- Cyclical and/or event-oriented process data traffic (short system reaction time) possible.

CANopen specifications are compiled by CAN in Automation (CiA) and partially available to the public. Various suppliers make source codes for master and slave devices available.

All manufacturers with certified CANopen products on the market are normally members of the CiA. As a result of our active membership in the CiA, Murrelektronik possesses profound CANopen know-how for the development of components for this bus system.

You will find us and the CiA at:

www.can-cia.com und www.murrelektronik.com

3.3 CAN bus system data

The following Table 3-1 illustrates the most important system data.

Transmission medium	Twisted, screened two-wire cable
Network topology	Bus structure
Data rates	Dependent on the cable length (max. 1000 kBit/s): 1000 kbit/s 40m 800 kbit/s 50m 500 kbit/s 100m 250 kbit/s 250m 125 kbit/s 500m 50 kbit/s 1000m
Transfer duration	134µs for an 8 byte telegram at 1000 kBits/s
Number of bus devices	Max. 30 without repeater, over 200 with repeater
Transmitter output current	>25mA
Number of I/O points	Standard CAN: 16384 Bytes (PDO data)
Addresses	One specific address per device in a range between 0...128
Access	Multi-master, messages with priorities
User data	8 bytes per telegram
Terminating resistors	120 Ω, always at the ends of the data cable
Error recognition	Identification of faulty messages, automatic repetition
Spur line length ¹	Data rate: 1000kBit/s: Max. spur line length: 0.3m Cumulative spur line length: 1.5m 500kBit/s: Max. spur line length: 6.0m Cumulative spur line length: 30m

Table 3-1: CAN Bus system data



To limit the influence of the reflected wave on the signal quality, the spur line should be limited to max. 0.3m for a data rate of 1Mbit/s.

¹ Calculation of the max. spur line length does not come under the scope of this manual.
For further information see CiA-DR303-1.

3.4 CAN bus level

In CAN, bus levels are differentiated as dominant and recessive. The dominant bus level overwrites the recessive one. If various bus stations simultaneously transmit both dominant and recessive bus levels, the dominant level establishes itself on the bus. The recessive level can establish itself only if it is being transmitted by all bus devices simultaneously. The recessive level is "1" (high) and the dominant level "0" (low). When there is no bus transmission traffic, the bus level is recessive.

Every CAN-Bus device must be able to implement the output level variances $V_{diff} = VCAN_H - VCAN_L$ shown in Table 3-2. A transmission output current of >25mA must be possible.

Dominant bus level	$V_{diff} \geq 0.9V$
Recessive bus level	$V_{diff} = -0.5V...+0.5V$
VCAN_H dominant (nominal)	3.5V
VCAN_L dominant (nominal)	1.5V
Bus-Idle-operation	$VCAN_H = VCAN_L = +2.5V$

Table 3-2: CAN bus level

3.5 Information for the beginner

CANopen is a field bus system for industrial use whose advantages lie in its application. In particular, the various types of process data transmission permit a host of different applications.

To make the system even easier and safer for beginners to use, we recommend proceeding as outlined in Table 3-3 below.

Work phase	Question	Note
Planning	How many I/O's are required in total?	This determines if one or more CANopen networks are required.
Planning	How great is the system power requirement?	Important for the selection of a suitable system power supply unit.
Planning	How large is the entire scope of the system?	Important for selecting the Can-Bus cable and data rate.
Configuration	How are the NODE Ids of the modules to be assigned?	To avoid addressing errors, create an assignment scheme and carefully label all addressed modules accordingly.
Installation	Where will the modules be installed?	Depends on the module enclosure type. Either in a switch cabinet or terminal box. Place modules of enclosure type IP 67 close to sensors and actuators for the sake of greater efficiency.
Setup	How will the system configuration be executed?	The modules can be configured with a suitable software via the imported EDS file.
Setup	Have all CAN-Bus devices on the bus reported following Power ON?	When all CAN-Bus devices have reported, slave configuration can begin.
Setup	How can a simple I/O function test be performed?	Quick and straightforward, with special, easy to use setup tools such as the CANopen- Master simulator ²). Alternatively, the I/O test can also be performed via PLC software.

Table 3-3: Planning and configuration procedure

² Article No.: 55805 (DIN supply), 55825 (PS2 supply)

3.6 System cables

The selection of CAN-Bus cables and the respective data transfer rate takes place in three steps:

- ① Determine the required cable core cross-section according to Table 3-4, depending on the number of CAN-Bus devices and the cable length.
- ② With reference to Table 3-5, establish the specific conductor resistance and/or core cross-section in the AWG.
- ③ Select the permissible data transfer rates from Table 3-6.

In exceptionally difficult situations, it may not be possible to establish cable parameters and permissible data transfer rates with the procedure described. In such cases, please refer to the ISO 11898, CiA-DS102 und CiA-DR303-1 standards. The following sections are excerpts from these standards.

3.6.1 CAN-Bus cable description

The CiA-DS102 for bus connection and bus medium enables the realization of open CAN networks as a general industrial field bus. The CiA standard is based on high-speed bus interfacing according to ISO 11898; it also specifies a sub-D connector and a surge impedance-terminated, two-wire lead cable with common return circuit as transfer medium. The maximum cable length is 1000 meters. The maximum length of the spur lines at a data transfer rate of 1000kBit/s is 0.3m. The bus cable can be either twisted or screened. Cable screening is required because of the transmission technology. For spur lines, a cross-section of 0.25mm²...0.34mm² is usually sufficient. Further CiA specified cables and connectors are indicated in DR303-1.



The maximum length of the spur lines at a data transfer rate of 1000kBit/s is only 0.3 meters.

The number of CAN-Bus devices must be taken into consideration when selecting the conductor cross-section. The limit values are shown in Table 3-4 below.

Number of CAN-Bus devices	Cable length in m	Core cross-section in mm ²	Cable resistance in Ω
32	100	0,25	<21
	250	0,34	
	500	0,75	
64	100	0,25	<18,5
	250	0,50	
	500	0,75	
100	100	0,25	16
	250	0,50	
	500	1,00	

Table 3-4: Cable cross sections in dependence of cable length and number of bus devices



Repeaters must be used for more than 30 CAN-Bus participants.

Additional selection criteria include the DC parameters according to Table 3/5.

Cable length in m	Specific cable resistance in mΩ/m	Core cross- section in mm ²	Maximum data rate in kBits/s
0...40	70	0.25...0.34 AWG23, AWG22	1000 at 40m
40...300	< 60	0.34...0.6 AWG22, AWG20	500 at 100m
300...600	< 40	0.5...0.6 AWG20	100 at 500m
600...1000	< 26	0.75...0.8 AWG18	50 at 1000m

Table 3-5: DC cable parameters

The parameters listed in Table 3-5 are for networks according to ISO11898-2. In order to minimize voltage drop in the cable, a larger bus-terminating resistor should be selected for long cable lengths than specified in ISO11898-2. In system configuration, the DC connector parameters must also be taken into consideration. For each connector, 5mΩ...20mΩ must be added to the cable resistance.



The ground potential difference at CAN_GND connections of all CAN-Bus participants should not exceed 2V.



Plug connectors have a typical DC resistance of 5mΩ...20mΩ.

In approximation, the following is valid for bus termination:



Attention must be paid to ensure that the CAN bus between CAN_H and CAN_L is correctly terminated with 120 Ω.

The maximum permissible data rate is shown in Table 3-6.

Data rate in kBits/s	Cable length in m	Nominal bit time in µs
1000	30	1
800	50	1,25
500	100	2
250	250	4
125	350	8
100	500	10
50	1000	20
20	2500	50
10	5000	100

Table 3-6: Max. permissible cable length dependent on the data rate

Installation is greatly simplified through the use of cable harnesses. Wiring errors are avoided and setup is more rapidly successful. Murrelektronik offers field bus cables, power supply cables, sensor cables and accessories such as terminating resistors and T-fittings. Field assembled plugs and cables are also available.

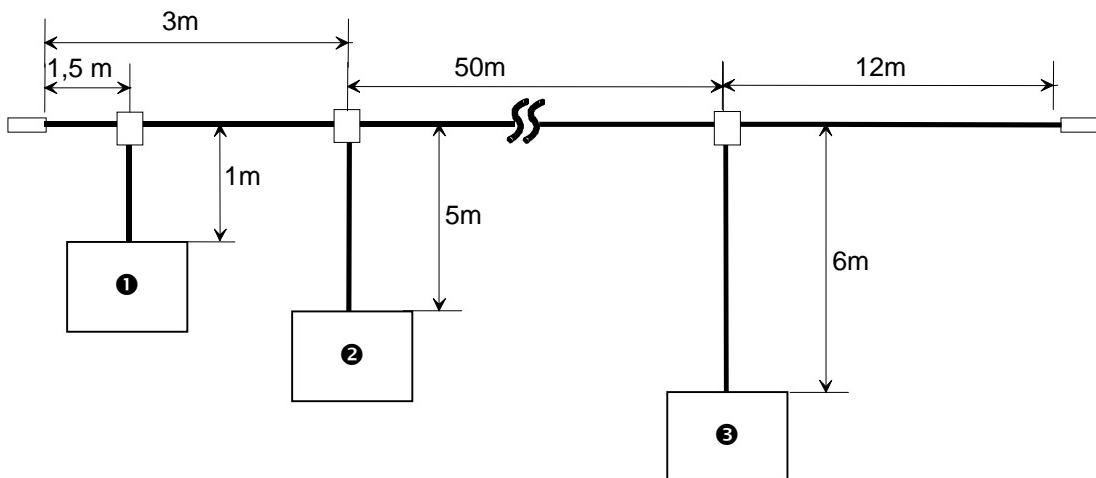
In addition, the specific signal run-time of the CAN-Bus cable must be taken into consideration. This factor lies in a range of 5ns/m in the case of electrical two-wire cables.



In the case of electrical two-wire cables, the signal run-time is 5ns/m.

3.6.2 Position of bus terminating resistors/maximum bus length

If the distance from a branch in the main cable to its furthest removed module is greater than the distance to the next terminator, this spur line length (Drop B) is calculated into the total cable length. The following is a network example:



- ❶ Node 1 (Drop A)
- ❷ Node 2 (Drop B)
- ❸ Node 3 (Drop C)

Fig. 3-1: Position of terminating resistors / max. bus length

Drop A:	does not appear in the max. cable length	1.5 m > 1 m
Drop B:	is calculated into the max. cable length	3 m < 5 m
Drop C:	does not appear in the max. cable length	12 m > 6 m

$$\text{Maximum bus length } 5 \text{ m} + 50 \text{ m} + 12 \text{ m} = 67 \text{ m}$$

In the above example, the bus terminating resistors have been installed at the end of Drop B and at the end of the 12m cable.



Attention must be paid to ensure that the CAN-Bus between CAN_H and CAN_L is correctly terminated (120Ω).

3.6.3 Power supply line



Calculation of the required conductor cross-sections is dependent on installation-specific configuration data and is therefore not covered in this manual.

3.7 System power supply



We recommend the use of primary switched-mode power supplies for application with the MVK-MC modules and for supplying the sensors and actuators.

When using in-phase regulated power supplies, assure that the overload-related power switch-off takes place only after a bus telegram has been transmitted (the MVK-MC module reverts to Pre-operational state after the power is switched off)!



The power at pin 1 of the power supply connector must never be switched OFF during operation; otherwise, the MVK-MC module can no longer participate in CAN-Bus communication.



MVK-MC modules require a DC power supply in the range of 18...30V.

System-related limit values regarding system power supply must be strictly observed if maximum functional safety and fault-free operation are to be ensured.



Always ensure that the system power, measured at the device furthest away from the power supply, does not drop below 18VDC.

A load current-related voltage drop in the power supply cable occurs due to the central power supply of the MVK-MC modules with all their connected sensors.



In critical cases, voltage drop optimisation can be realized by changing the location of the power supply unit within the overall system and by using power supply cables of greater conductor cross-section.



Calculation of the required conductor cross-sections is dependent on installation-specific configuration data and is therefore not covered in this manual.

3.8 System configuration

Following the initialisation phase, all CAN-Bus devices will have reported to the CAN-Bus with one Boot-Up-Message each. An appropriate setup tool can then start to read in the CANopen network and, based on the data received, assign each CAN-Bus device the corresponding EDS file. From the EDS file information, the master creates an adequate periphery map of all recognized slaves in the PLC. The user can assign the read-in I/O bytes to logical addresses in the PLC. Fig. 3-2 shows the schematic of a CANopen network layout.

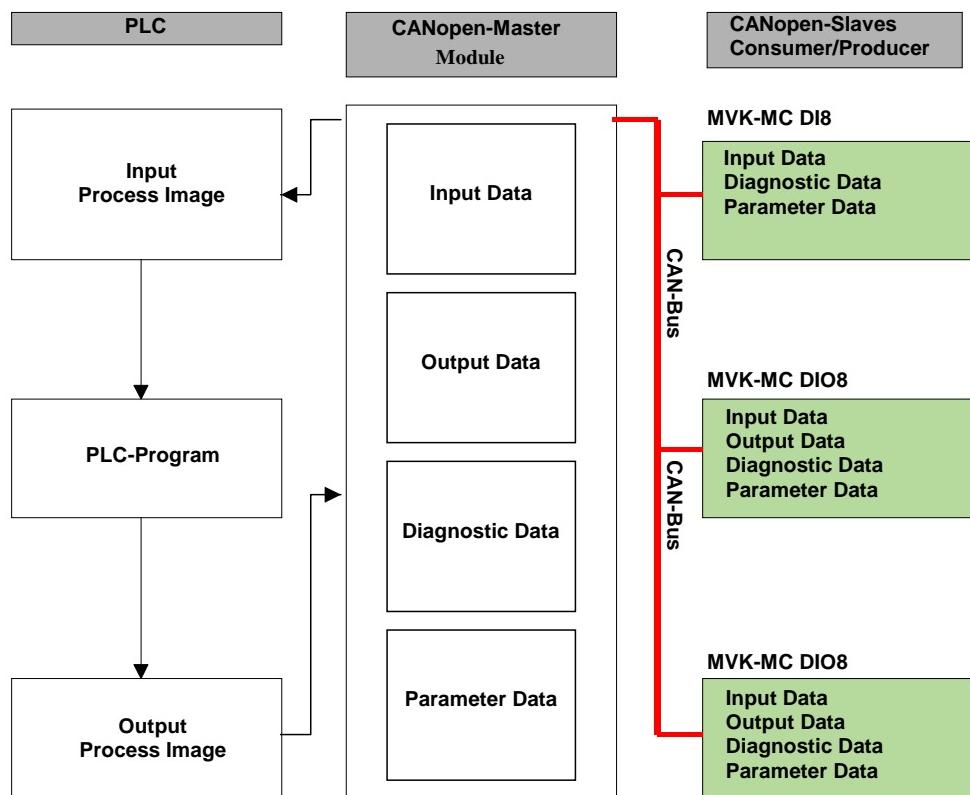
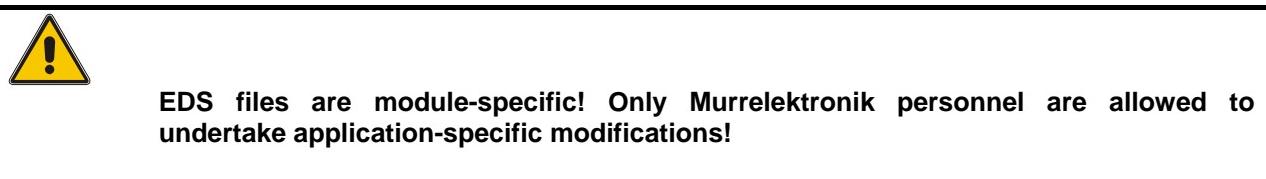


Fig. 3-2: Data transfer between the PLC, Interface module (CANopen-Master) and CANopen slaves

3.8.1 EDS files

The EDS file is created explicitly for the device type (I/O). Consequently, each module of the MVK-MC series has a separate EDS file (*.eds) plus an icon (*.ico) assigned to it.

The EDS file contains a lot of information concerning the module e.g.:
Device type, manufacturer, Vendor ID, article number, software version, hardware version etc.



EDS files are assigned as shown in Table 3-7:

Module type	Name of EDS file	Name of icon
MVK-MC DI8 (DI8)	MVKCDI8D.eds	MVKCDI8D.ico
MVK-MC DIO8 (DI8)	MVKCDIO8D.eds	MVKCDIO8D.ico
MVK-MC DI4DO4 (DI8)	MVKCDI4DO4D.eds	MVKCDI4DO4D.ico

Table 3-7: EDS files

- !** The last character in the EDS file name stands for the EDS file language e.g.
D= Deutsch, E= English.
For the function of the assembled network, it does not matter which file is loaded into
the setup tool. Only the readability of the variables is improved!
- !** The latest EDS files can be found in the Internet under:
<http://www.murrelektronik.com> in the download area under configuration files.

3.8.2 Addressing

The Node ID of the MVK-MC module is set as a decimal number with the two rotary switches (see Fig. 3-3).

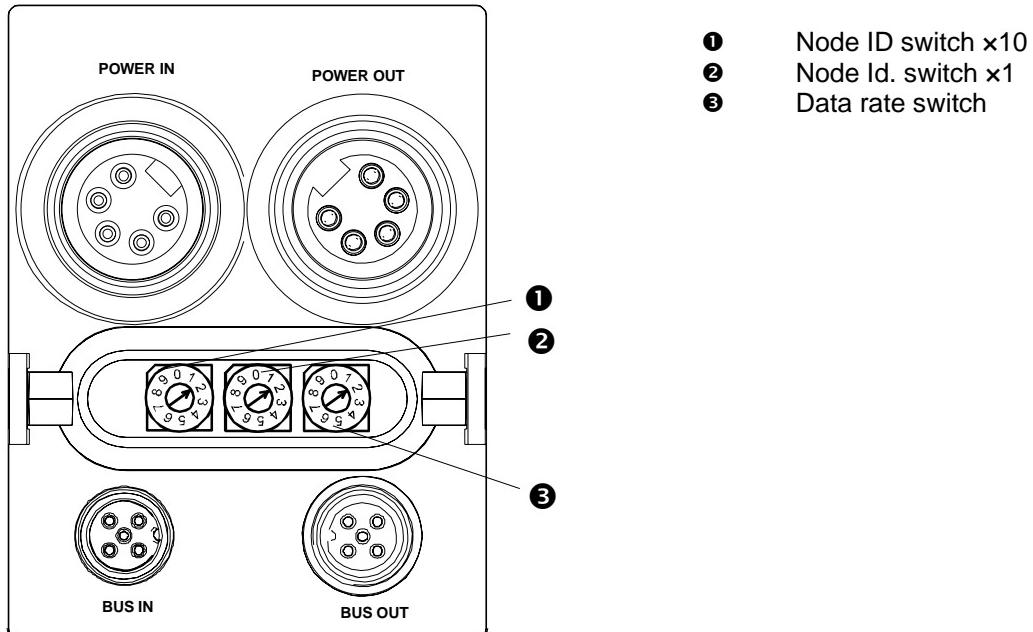


Fig. 3-3: Data rate and Node ID-switches



There are two switches for setting the Node ID.: x10 (decades) and x1 (single digits). Permissible addresses are 1 to 99.

The MVK-MC module receives the Node ID. only when it is supplied with power. As a result, a power reset must always be made if the station address was changed.



Always assure that the Node ID. of each device in the CANopen network is unique (non-duplicate).

The address 0 is not allowed!

3.8.3 Data rate settings

The data transfer rate is set with a rotary switch (see item 3 in Fig. 3-3). Bit timing is according to CiA directives.

The following data rates can be set:

Switch position	Data rate
0	Automatic recognition
1	10 kBit/s
2	20 kBit/s
3	50 kBit/s
4	100 kBit/s
5	125 kBit/s
6	250 kBit/s
7	500 kBit/s
8	800 kBit/s
9	1000 kBit/s

Table 3-8: Data rate setting with rotary switch

Messages (e.g. SYNC telegrams) must be transferred on the CAN-Bus for automatic data rate recognition (switch position 0) to take place. The MVK-MC module tries to recognize the data rate being used and accepts this as a standard value. As long as the module is searching for the data rate, the MS and NS LED's blink at 10Hz. Only after the data rate has been successfully detected does the MVK-MC module assume "Pre-operational" state and can be used as a CANopen module. The data rate is searched again every time the module is started up. The detected data rate is not stored. If the data rate is to be changed, the module must be re-started. A NMT-reset (reset node or reset communication) is not sufficient for changing the data rate.



**The data rate search is performed only when module power supply UB is switched ON.
The data rate setting is accepted only when the power supply is turned ON. A power reset is required for changing the data rate.**

3.9 Set-up

The CANopen network, including the master, must be started for this purpose. The network is read in with the aid of a software tool (incl. hardware). Prior to this, the EDS files of the MVK-MC modules must be incorporated into the software.

The CANopen devices are recognized in the sequence in which they were addressed.

When the entire system has been configured and the bus communication is active, additional modules may join the CAN-bus any time providing the Node ID. and the data rate are correctly set

Typical errors during setup include: Damage to the bus cable, incorrect data rate, Node ID. duplicity, CAN_H and CAN_L swapped on the bus cable, power supply not available, bus not correctly terminated and EDS files incorrectly or not at all integrated!



Devices with identical Node IDs cannot be configured on the CAN-Bus. Each device type possesses an EDS file (*.eds) and an icon (*.ico).



Prior to set-up, a competent system structure check of the field bus must be assured!

3.9.1 Setup example

The following presents one possible setup procedure:

- ① Connect one or more CANopen devices to the CAN bus (assure professional setup of the field bus).
- ② Turn all the power supplies for the bus modules ON (check voltages before supplying participating bus devices etc.).
- ③ The master will first perform a self-test (master & PLC power must be ON).
- ④ The MVK-MC modules now also display their status via the LEDs at the bus portion (MS=green blinking (Pre-operational) and NS=off).
- ⑤ The master reads in the CANopen network and displays all connected bus devices.
- ⑥ The master executes the slave configurations in succession.
- ⑦ The master starts all CAN-Bus devices with the NMT command: Operational all Nodes.
- ⑧ The slaves are now ready to exchange PDO data.



Before proceeding with the setup, please be sure to read the operating instructions for all installed CANopen modules and their software!



This manual illustrates the setup procedure by way of an example!

4 Installation information

4.1 MVK-MC installation

The modules of the MVK-MC series can be mounted directly on an installation panel or on a machine. The module features two mounting holes for this purpose.

It must be assured that the mounting surface is smooth and flat to prevent mechanical stress in the module housing.

The module is affixed with two screws 6 mm in diameter and two lock washers DIN 433 T₁/T₂. The required torque is 9 Nm.

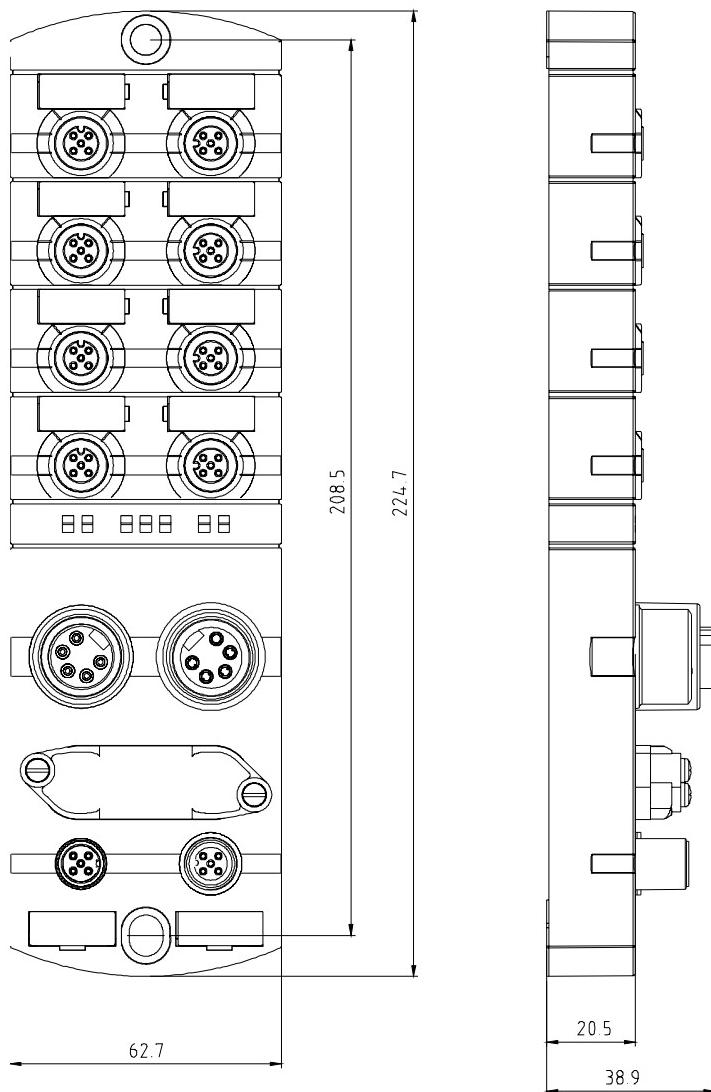


Schéma 4-1 : Côtes de fixation



ATTENTION :
 Respect a distance bigger than 3 mm between 2 modules.

4.2 Cables

4.2.1 CAN-Bus cables

The CAN-Bus network requires cables conforming to ISO 11898 and DR 303-1 standards. Ready cable harnesses of various lengths are also available to guard against wiring errors.

4.2.2 Power supply cables

Module supply cables must have VDE approval and a maximum core cross-section of 1.5 mm². All further power supply characteristics depend on individual applications and are not covered in this manual.



Maximum allowable core cross-section 1.5mm².

4.2.3 Cable routing

Cable routing is a very important criterion for interference-free operation of the equipment. When routing cables, be sure to observe the following:

- Do not route bus cables parallel to high-voltage cables; where applicable, route in separate bundles or cable troughs or channels.
- The PE cable connection must be star-shaped.
- Prevent potential differences by laying equipotential bonding conductors.
- CAN-Bus cable screens must be attached to the connectors.
- All analog signals should be carried by screened cable.
- Signal and power supply cables to the terminal block should be sufficiently long to prevent pull-stress on the terminals.

4.2.4 Prevention of interference voltage

The following points must be observed in order to reduce or prevent voltage interference when setting up a system:

- Screening of devices and cables where stipulated (VDE 0113 and VDE 0829 etc.).
- Suitable location of the devices and cables.
- Take appropriate interference suppression measures for devices emitting interference (e.g. frequency transformers, valves, contactors etc.).
- Massive and comprehensive device and screen grounding methods.

5 MVK-MC module connection technique

5.1 Connection overview

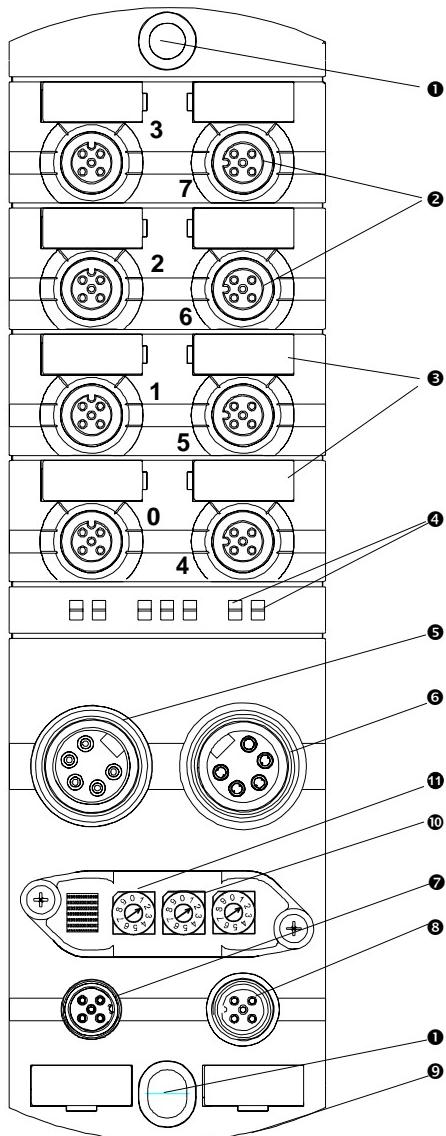
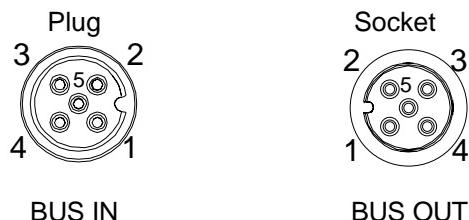


Fig. 5-1: MVK-MC module connection overview

- ① Mounting holes
- ② M12 round sockets for inputs and outputs
- ③ Identification label
- ④ Display elements
- ⑤ Power supply connection
- ⑥ Outgoing power supply connection
- ⑦ Incoming bus interface
- ⑧ Outgoing bus interface
- ⑨ PE connection
- ⑩ Address switch
- ⑪ Baud rate switch

5.2 Bus connection

5.2.1 Contact assignments of bus connection M12 (A-encoded)

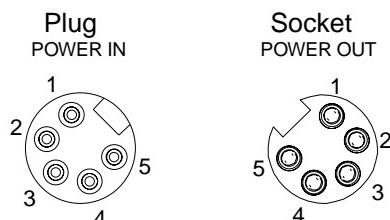


Contact No.	Signal	Description
1	Screen	Bus screen
2	NC	Not connected
3	NC	Not connected
4	CAN_H	CAN_HIGH
5	CAN_L	CAN_LOW

Fig. 5-1 : Bus contact assignments

5.3 Power supply connection

5.3.1 Contact assignments of power connector 7/8" (Mini-Style)



Pin 1	0 V
Pin 2	0 V
Pin 3	PE
Pin 4	Sensor supply
Pin 5	Actuator supply

Fig. 5-2 : Contact assignments of power connector 7/8" (Mini-Style)

The max. permissible sectional area of the line 1,5 mm². It is limited by the 7/8" connector.



The chief determining factor in selecting a suitable transmission cable in regard to energy transfer is the DC resistance.

Auxiliary power supply is needed to supply the actuators and sensors.



CAUTION :
Wrong poling of the power supply can damage the module.



Always ensure that the sensors and actuators power supply voltage, measured at the module furthest away from the power supply does not drop below 18 V DC.



CAUTION :
Please note that the 7/8“ connector is designed for max. 9 A per pin. This must be taken into account for downstream power supply.

5.3.2 Connecting the power supply cable to the MVK-MC module

The following procedure is recommended:

- ① Install the MVK-MC module.
- ② Attach the PE cable to the MVK-MC module.
- ③ Establish CAN-bus connection.
- ④ Connect the power supply.

Pin 3 of the power supply connector is active only for DO modules MVK-MC DIO8 (DI8) and MVK-MC DIO8 (DIO8) (+24V actuator power supply).

This actuator voltage can be configured to switch off for EMERGENCY STOP circuits.

As a general rule, connected consumers are supplied by an auxiliary power supply.



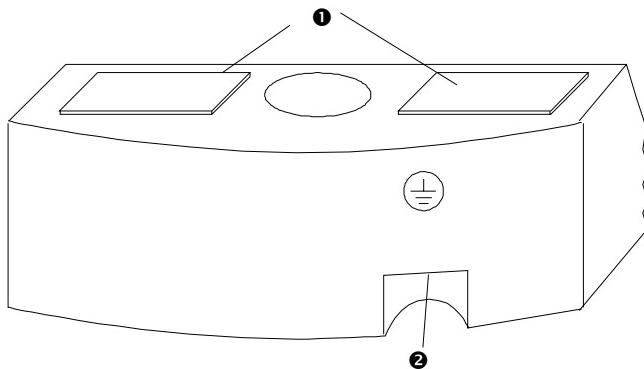
On MVK-MC modules, the power supply at pin 1 of the power supply connector may not be conducted through EMERGENCY STOP circuits as this power supplies the entire I/O portion and the sensors with energy.



The actuator power supply, on the contrary, can be configured to switch off for EMERGENCY STOP circuits (DO modules only).

5.4 Connecting the PE cable to the MVK-MC module

The PE connection is found at the lower side of the MVK-MC module housing. The screw to fasten the cable is located under the label (see Fig. 5-2).



- ① Labels
- ② PE connection screw

Fig. 5-2: PE connection



Connect the PE line at the MVK-MC housing in a low-resistance grounding manner with the ground cable of the system.

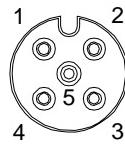
5.5 Connections for sensors (encoders)

Sensors are supplied directly via pins 1 (+24V) and 3 (0V) of the M12 sockets.
 Pin 4 of the M12 socket is the function input (DI modules). Pin 2 is the diagnosis input.

Table 5-1 shows the correlation between M12 socket and I/O labelling.

M12-socket	Function input (Pin 4)	Diagnosis input (Pin2)
0	00	10
1	01	11
2	02	12
3	03	13
4	04	14
5	05	15
6	06	16
7	07	17

Table 5-1: M12 socket labelling, inputs



- Pin1: +24V
 Pin2: 10 to 17 diagnosis or function input
 Pin3: 0V
 Pin4: 00 to 07 function input
 Pin5: PE

Fig. 5-3: Pin assignment of M12 sockets



Modules of the MVK-MC series may be loaded with max. 200mA per M12 socket (sensor current)!
If an M12 socket (I/O channel) is not in use, it must be fitted with an M12 cap in compliance with model type IP 67 specifications.

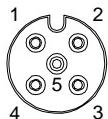
5.6 Actuator connections (consumers)

Actuators are addressed via pin 4 of the M12 sockets (DO modules),
 Pin 2 is the diagnosis input. For Art. -No. 55306, Pin 2 can also be an output.

Table 5-2 shows the correlation between M12 socket and I/O labelling.

M12 socket	Output (Pin 4)	Output (Pin2) (only Art.-No. 55306)	Diagnosis input (Pin2)
0	00	10	10
1	01	11	11
2	02	12	12
3	03	13	13
4	04	14	14
5	05	15	15
6	06	16	16
7	07	17	17

Table 5-2: M12 socket labelling, outputs



- Pin1: +24V
 Pin2: 10 to 17 diagnosis or function input
 Pin3: 0V
 Pin4: 00 to 07 output
 Pin5: PE

Fig. 5-4: Pin assignment of M12 sockets



Modules of the MVK-MC series may be loaded with max. 1.6 A per output (actuator current), total of max. 8A possible.
If an M12 socket (I/O-channel) is not used, it must be fitted with an M12 cap in compliance with IP 67 specifications.

5.7 Unused connections



Unused sockets must be fitted with a blind cap. Otherwise the IP 67 protection class is not assured.

Art. No.	Designation
55 468	M12 blind cap black (4 pcs)
55 390	7/8" blind cap (thread)

6 CANopen

6.1 Object directory structure

CANopen assigns a basic functionality to each device. It is possible to assign further functions that however, must conform to the specifications in the device and communication profile. The device characteristics are specified in the object directory. The object directory is created in the device's range of application. The object directory structure is shown in table 6-1 below. Communication profile data is located in the range between 1000H and 1FFFH (highlighted grey below) and the device profile data between 6000H and 9FFFH.

Index	Object
0000	Not used
0001 - 001F	Static Data Types
0020 - 003F	Complex Data Types
0040 - 005F	Manufacturer Specific Data Types
0060 - 0FFF	Reserved for further use
1000 - 1FFF	Communication Profile Area
2000 - 5FFF	Manufacturer Specific Profile Area
6000 - 9FFF	Standardized Device Profile Area
A000 - FFFF	Reserved for further use

Table 6-1: Object directory structure

Object directory entries are accessed by means of an index with which the entire data structure is addressed. A given element can be selected from the data structure by means of the sub-index. An example of the addressing structure is illustrated in Table 6-2 below.

Index	Sub-index	Description
6000H	0	Number of entries (here 2)
	1	Inputs 1 to 8
	2	Inputs 9 to 16

Table 6-2: Use of index and sub-index

6.2 Communication profile: General description

The communication profile is based on the services and protocols provided by CAL. It contains functions for distributed synchronous operation, provides a common time base and defines a uniform error signal flow. Application objects can be assigned to communication objects. The communication profile also establishes system initialisation. The CANopen communication model differentiates between four different types of messages (objects):

1. **Administrational Messages** (Management messages). These encompass layer management (LMT), network management (NMT) and identifier distribution (DBT). Implementation is managed by CAL management services.
2. **Service Data Messages**. Service-Data-Objects (SDO) are used for reading and writing entries in the device object directory. The SDOs are implemented by means of CAL application layer services. Each CANopen device supports at least one SDO.

3. **Process Data Messages.** PDO (Process Data Object) transfer is the most rapid means of transferring data as transmission takes place without an additional protocol. A differentiation is made between synchronous and asynchronous transfer. PDOs are implemented by CAL application services.
4. **Pre-defined Messages.** There are three pre-defined communication objects: SYNC, Time Stamp and Emergency Object. Support of these objects is not mandatory. Implementation is via CAL application services.

6.3 Process data (PDO) – Description of transmission modes

CANopen offers various possibilities of transferring process data. Fig. 6-1 offers an overview of possible CANopen operation modes.

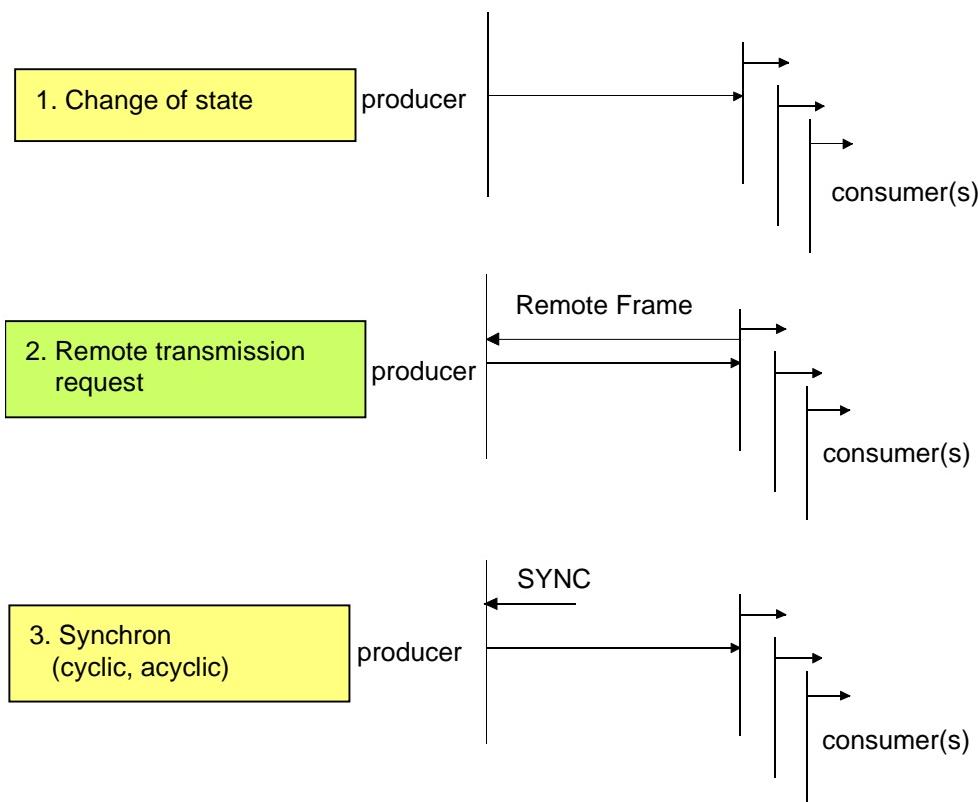


Fig. 6-1: Overview of PDO transmission modes

A more detailed description of PDO transmission modes is provided below:

6.3.1 “Change of state” PDO transmission (asynchronous)

“Change of state” refers to the changing of an input value (event control). The data is transmitted on the bus immediately after having been modified. The bus bandwidth is optimally used by the event control method, as the entire process image is not constantly being transmitted, but only the modifications of the same. Short reaction times are also achieved, as it is not necessary to wait for the next query by a master when an input value changes.

If the “Change of state” PDO transmission is selected, one must remember that, under certain circumstances, multiple events may occur simultaneously and result in delays until a relatively low priority PDO can be transmitted on the bus. Also, a constantly changing input with high priority PDO must be prevented from blocking the bus (“babbling-idiot”). For this reason, event control is disabled for analog inputs (according to CANopen specifications) as a default condition and must be activated with object 0x6421.

6.3.2 „Remote transmission request“ PDO transmission

PDOs can also be polled by the master via data request telegrams (Remote-Frames, so-called RTR-telegrams). In this manner, the input image (in the case of event controlled inputs) can also be brought to the bus without input changes, e.g. if a monitor or diagnostics unit being implanted in the network during run-time. The MVK-MC modules do not support this transmission method.

6.3.3 „Synchronous“ PDO transmission

It is not only in drive applications that it makes sense to synchronize reading the incoming information with setting the outputs. CANopen offers the SYNC-object for this purpose. This is a high priority CAN telegram without user data, the receipt of which is used by the synchronized nodes as a trigger to read the inputs or to set the outputs. Fig. 6-2 illustrates the time response in synchronized PDO transmission.

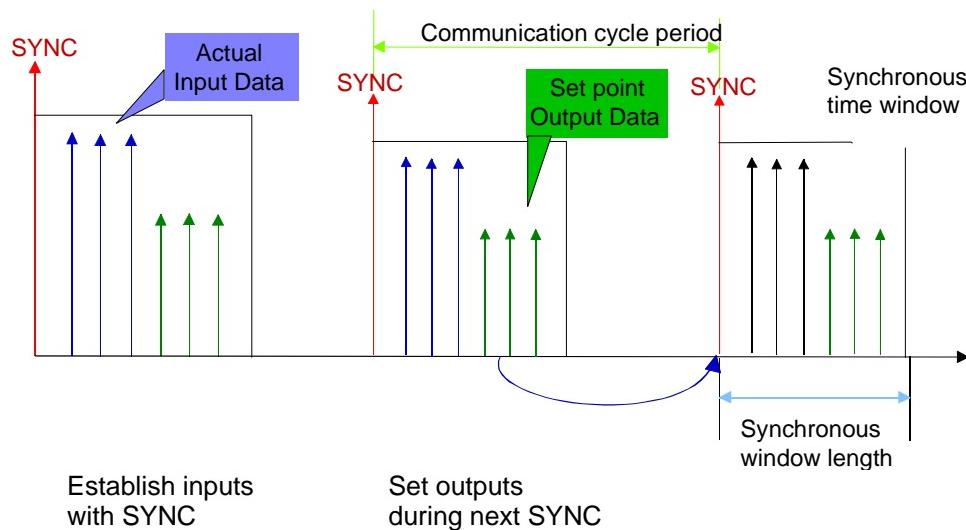


Fig. 6-2: Synchronized PDO transmission

6.4 Access to the object directory through SDO access

Fig. 6-3 illustrates the SDO telegram structure:

	Byte 0	Byte 1-3		Byte 4-7	
Start of telegram-frame	Command-specification	3 bytes object identification		4 bytes object data	End of telegram-frame
	8-bit (s. Table 6-3)	16-bit Index Data-type: UNSIGNED 16	8-bit Sub-index Data-type: UNSIGNED 8	32-bit	

Fig. 6-3: SDO structure

Values must be entered in Byte 0 (Command-Specification) according to Table 6-3:

Data length	Command specifier			
	SDO Download Request	SDO Download Response	SDO Upload Request	SDO Upload Response
8 Bit	2FH	60H	40H	4FH
16 Bit	2BH	60H	40H	4BH
32 Bit	23H	60H	40H	43H

Table 6-3: SDO-Command specifier

Following are two examples of SDO access:

Example 1: Life Time Factor Object 100DH is read out. The MVK-MC module answers with value 2H
Telegram structure in Hex-Code:

Upload Request: 40 0D 10 00 00 00 00 00
Upload Response: 4F 0D 10 00 02 00 00 00

Example 2: Life Time Factor Object 100DH is written with the value 1H.
Telegram structure in Hex-Code:

Download Request: 2F 0D 10 00 01 00 00 00
Download Response: 60 0D 10 00 00 00 00 00

The communication object identifiers (COB-Ids) for SDO access are entered in object 1200H (Sub-index 1 and 2).

6.4.1 Errors in SDO access / SDO abort codes

If an access error occurs, the MVK module transmits a reply with the object that was the access target. The value 80H is written in Byte 0 (Command specification). Bytes 4-7 of the SDO contain the abort code as shown in Table 6-4. This is an excerpt from CiA-DS301.

Abort Code	Description
0503 0000h	Toggle bit not alternated
0601 0000h	Unsupported access to an object
0601 0002h	Attempt to write a read only object
0602 0000h	Object does not exist in the object dictionary
0604 0041h	Object cannot be mapped to the PDO
0604 0043h	General parameter incompatibility reason
0604 0047h	General internal incompatibility in the device
0607 0010h	Data type does not match, length of service parameter does not match
0609 0011h	Sub-index does not exist
0609 0030h	Value range of parameter exceeded (only for write access)
0609 0031h	Value of parameter written too high
0800 0022h	Data cannot be transferred or stored to the application because of the present device state

Table 6-4: Abort codes during SDO access errors

6.5 Device profile: General description

The device profile contains the functionality description of the device. All application objects (functions and parameters) of a device are defined in the device profile. It forms a standardized interface for device functionality. Entries in the object directory are identified through the index. Access to entries is accomplished by means of SDO services which enable entries to be read or written.

6.5.1 Implemented minimal device configuration

The following device configuration is available after the device-internal initialisation:

1. Minimal device configuration without dynamic ID distribution. ID assignment as shown in Table 6-5 and Table 6-6.
2. Static mapping of application objects to PDOs.
3. Synchronous, asynchronous, cyclic and acyclic PDO transmission with master monitoring during synchronous PDO transmission.
4. Emergency telegrams when an error occurs.
5. CANopen Boot-Up procedure per NMT services and
6. Node guarding and Life guarding.

Object	Function code (Binary)	Resulting COB-ID		CMS Priority
		(Hex)	(Dec)	
NMT	0000	0	0	0
SYNC	0001	80H	128	0

Table 6-5: Broadcast object of pre-defined master-slave connections

Object	Function code (Binary)	Resulting COB-ID		CMS Priority
		(Hex)	(Dec)	
EMERGENCY	0001	81H - FFH	129 - 255	0 , 1
PDO (tx)	0011	181H - 1FFH	385 - 511	1 , 2
PDO (rx)	0100	201H - 27FH	513 - 639	2
PDO (tx)	0101	281H - 2FFH	641 - 767	2 , 3
PDO (rx)	0110	301H - 37FH	769 - 895	3 , 4
SDO (tx)	1011	581H - 5FFH	1409 - 1535	6
SDO (rx)	1100	601H - 67FH	1537 - 1663	6 , 7
Node-Guarding	1110	701H - 77FH	1793 - 1919	-

Table 6-6: Objects of pre-defined master-slave connection (as seen from the slave)

6.6 CANopen Boot-Up

In the minimal device equipment, a short boot sequence takes place. This process is shown in Fig. 6-4.

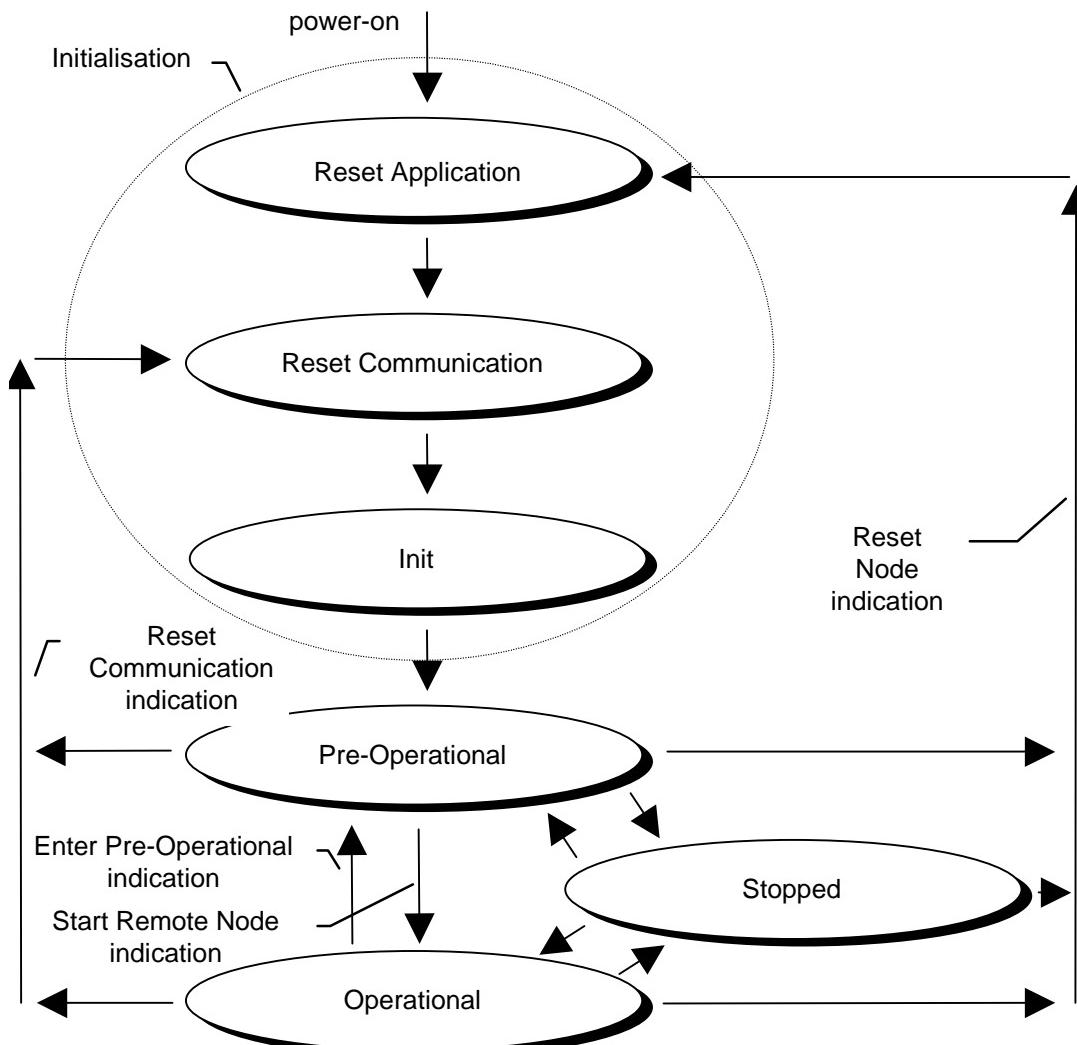


Fig. 6-4: Status diagram for a CANopen device with minimal device equipment

6.6.1 Reset Application

Following a device start or NMT service “Reset node”, the device is in a “Reset application” state. The device profile is initialised in this condition. Following this, all device profile entries are set to default values. When initialisation is completed, the device automatically assumes “Reset communication” state.

6.6.2 Reset Communication

This condition is assumed through NMT service “Reset communication” or after “Reset Application”. All parameters (standard value, according to device configuration) of the supported communication objects (1000H - 1FFFFH) are written to the object directory. Following this, the device automatically assumes the “Init” state.

6.6.3 Init

All necessary communication objects (SDO, PDO, SYNC, Emergency) are defined during the “Init” state. The assigned CAL services are set up and the CAN controller is configured accordingly while in this state. With this, device initialisation is complete and the device assumes “Pre-operational” state.

6.6.4 Pre-Operational

The device assumes “Pre-operational” state following a Reset or through NMT Service “Enter Pre-operational”. In this state, the device can be reconfigured according to its equipment. Only the SDOs, however, are available for reading and writing of device data. The device waits for a network start once the configuration is complete.

6.6.5 Stopped

NMT service “Node stop” causes the device to assume the “Stopped” state. The device cannot be configured in this condition. No services for reading and writing of device data (SDO) are available. Only the slave monitoring (Node Guarding) function remains active.

6.6.6 Operational

The full device functionality can be used if the CANopen network is brought into “Operational” state by NMT service “Node start”. Communication can take place via PDOs and via SDOs as well.



Configuration changes during “Operational” state can have unforeseen effects and should therefore be made only in the “Pre-operational” state.

7 Object overview

7.1 Communication profile - Overviews

7.1.1 MVK-MC DI8 (DI8), Art.-No.: 55304

Index	Name	Access	Standard value
1000H	Device Type	read only	00010191H
1001H	Error Register	read only	0H
1002H	Manufacturer Status Register	read only	0H
1003H	Pre-defined Error Field	read only	*
1005H	COB-ID SYNC-Message	read & write	80H
1006H	Communication Cycle Period	read & write	0
1008H	Manufacturer Device Name	read only	MVKCM DI8 (DI8)
100AH	Manufacturer Software Version	read only	SW1.04
100CH	Guard time	read & write	0
100DH	Life time factor	read & write	0
1010H	store parameters	read & write	*
1011H	Restore default parameters	read & write	*
1014H	COB-ID emergency	read & write	80H + Node Id.
1016H	Consumer heartbeat time	read only	*
1017H	Producer heartbeat time	read only	*
1018H	Identity Object	read only	*
1200H	Server SDO parameter	read only	*
1405H	Receive PDO Communication Parameter	read & write	*
1605H	Receive PDO Mapping Parameter	read & write	*
1800H	Transmit PDO Communication Parameter	read & write	*
1805H	Transmit PDO Communication Parameter	read & write	*
1A00H	Transmit PDO Mapping Parameter	read & write	*
1A05H	Transmit PDO Mapping Parameter	read & write	*

Table 7-1: Overview of supported objects in the communication profile of the DI8 module

(*)- If there is no Entry under standard values, the object index has further sub-indices, the contents of which are described in detail in the following sections.

7.1.2 MVK-MC DIO8 (DI8), Art.-No.: 55305

Index	Name	Access	Standard value
1000H	Device Type	read only	00030191H
1001H	Error Register	read only	0H
1002H	Manufacturer Status Register	read only	0H
1003H	Pre-defined Error Field	read only	*
1005H	COB-ID SYNC-Message	read & write	80H
1006H	Communication Cycle Period	read & write	0
1008H	Manufacturer Device Name	read only	MVKCM DIO8 (DI8)
100AH	Manufacturer Software Version	read only	SW1.04
100CH	Guard time	read & write	0
100DH	Life time factor	read & write	0
1010H	store parameters	read & write	*
1011H	Restore default parameters	read & write	*
1014H	COB-ID emergency	read & write	80H + Node Id.
1016H	Consumer heartbeat time	read only	*
1017H	Producer heartbeat time	read only	*
1018H	Identity Object	read only	*
1200H	Server SDO parameter	read only	*
1400H	Receive PDO Communication Parameter	read & write	*
1405H	Receive PDO Communication Parameter	read & write	*
1600H	Receive PDO Mapping Parameter	read & write	*
1605H	Receive PDO Mapping Parameter	read & write	*
1800H	Transmit PDO Communication Parameter	read & write	*
1805H	Transmit PDO Communication Parameter	read & write	*
1A00H	Transmit PDO Mapping Parameter	read & write	*
1A05H	Transmit PDO Mapping Parameter	read & write	*

Table 7-2: Overview of supported objects in the communication profile of the DIO8 module

(*)-If there is no Entry under standard values, the object index has further sub-indices, the contents of which are described in detail in the following sections.

7.1.3 MVK-MC DIO8 (DIO8), Art.-No.: 55306

Index	Name	Access	Standard value
1000H	Device Type	read only	00030191H
1001H	Error Register	read only	0H
1002H	Manufacturer Status Register	read only	0H
1003H	Pre-defined Error Field	read only	*
1005H	COB-ID SYNC-Message	read & write	80H
1006H	Communication Cycle Period	read & write	0
1008H	Manufacturer Device Name	read only	MVKCM DIO8 (DIO8)
100AH	Manufacturer Software Version	read only	SW1.04
100CH	Guard time	read & write	0
100DH	Life time factor	read & write	0
1010H	store parameters	read & write	*
1011H	Restore default parameters	read & write	*
1014H	COB-ID emergency	read & write	80H + Node Id.
1016H	Consumer heartbeat time	read only	*
1017H	Producer heartbeat time	read only	*
1018H	Identity Object	read only	*
1200H	Server SDO parameter	read only	*
1400H	Receive PDO Communication Parameter	read & write	*
1405H	Receive PDO Communication Parameter	read & write	*
1600H	Receive PDO Mapping Parameter	read & write	*
1605H	Receive PDO Mapping Parameter	read & write	*
1800H	Transmit PDO Communication Parameter	read & write	*
1805H	Transmit PDO Communication Parameter	read & write	*
1A00H	Transmit PDO Mapping Parameter	read & write	*
1A05H	Transmit PDO Mapping Parameter	read & write	*

Table 7-3: Overview of supported objects in the communication profile of the DIO16 module

(*)-If there is no Entry under standard values, the object index has further sub-indices, the contents of which are described in detail in the following sections.

7.2 Device profile overviews

7.2.1 MVK-MC DI8 (DI8), Art.-No.: 55304

Index	Name	Access	Standard value
6000H	Read Input 8-bit	read only	
6100H	Read Input 16-bit	read only	
6102H	Polarity Input 16-bit	read & write	0000H
6103H	Filter Constant Input 16-bit	read & write	0000H

Table 7-4: Overview of supported objects in the DI8 module device profile

7.2.2 MVK-MC DIO8 (DI8), Art.-No.: 55305

Index	Name	Access	Standard value
6000H	Read Input 8-bit	read only	
6100H	Read Input 16-bit	read only	
6102H	Polarity Input 16-bit	read & write	0000H
6103H	Filter Constant Input 16-bit	read & write	0000H
6200H	Write Output 8-bit	read & write	00H
6300H	Write Output 16-bit	read & write	0000H
6302H	Polarity Output 16-bit	read & write	0000H
6306H	Error Mode Output 16-bit	read & write	FFFFH
6307H	Error Value Output 16-bit	read & write	0000H
6308H	Filter Constant Output 16-bit	read & write	0000H

Table 7-5: Overview of supported objects in the DIO8 module device profile

7.2.3 MVK-MC DIO8 (DIO8), Art.-No.: 55306

Index	Name	Access	Standard value
6000H	Read Input 8-bit	read only	
6100H	Read Input 16-bit	read only	
6102H	Polarity Input 16-bit	read & write	0000H
6103H	Filter Constant Input 16-bit	read & write	0000H
6200H	Write Output 8-bit	read & write	00H
6300H	Write Output 16-bit	read & write	0000H
6302H	Polarity Output 16-bit	read & write	0000H
6306H	Error Mode Output 16-bit	read & write	FFFFH
6307H	Error Value Output 16-bit	read & write	0000H
6308H	Filter Constant Output 16-bit	read & write	FFFFH

Table 7-6: Overview of supported objects in the DIO16 module device profile

7.3 Manufacturer-specific device profile: Overview

7.3.1 MVK-MC DI8 (DI8), Art.-No.: 55304

Index	Name	Access
2000H	Parameter Input / Diagnostic Pin2	read & write
3000H	Manufacturer specific diagnostic	read & write

Table 7-7: Overview of supported objects in the DI8 module manufacturer-specific device profile

7.3.2 MVK-MC DIO8 (DIO8), Art.-No.: 55305

Index	Name	Access
2000H	Parameter Input / Diagnostic Pin2	read & write
2001H	Input / Output parameter	read & write
3000H	Manufacturer specific diagnostic	read & write

Table 7-8: Overview of supported objects in the DIO8 module manufacturer-specific device profile

7.3.3 MVK-MC DIO8 (DIO8), Art.-No.: 55306

Index	Name	Access
2000H	Parameter Input / Diagnostic Pin2	read & write
2001H	Input / Output parameter	read & write
3000H	Manufacturer specific diagnostic	read & write

Table 7-9: Overview of supported objects in the DIO 16 module manufacturer-specific device profile

7.4 Communication profile DS-301 V4.01- object description

All communication objects supported by the device are described below according to their entries in the object directory. With these objects, all necessary settings for communication and for general functions (I/O-independent functions) can be made or the device status can be requested.

7.4.1 Object 1000H: Device Type (DT)

This object describes the device type and its functionality. The device description consists of two 16-bit fields. The device profile number is written in one of these fields, the other field contains additional information.

Byte	
MSB	LSB
Additional Information	Device Profile Number
000XH	0191H

Table 7-10: Structure of device type, Object 1000H

Device Profile Number: 401D = 191H

The device profile number equals the number of the standard for I/O devices.

Additional Information: 1st bit set: Digital inputs available
2nd bit set: Digital outputs available

7.4.2 Object 1001H: Error Register (ER)

The device can display internal errors with the 8-bit ER field. If a device error occurs, the corresponding bit is set in the ER. The following errors can be displayed:

Bit	Significance	Comments
0	generic error	
1	current	
2	voltage	
3	temperature	not supported!
4	communication error	
5	reserved	not supported!
6	reserved	not supported!
7	manufacturer specific	Desina diagnostics

Table 7-11: Error register structure, Object 1001H

7.4.3 Object 1002H: Manufacturer-Status-Register

Data of diagnosis are recorded in this field of 32 bits. The **lower 8-Bit** of the register "Manufacturer Status Register" is contained in the EMCY- message and it is transmitted at the same time in the event of defect. The following table indicates the assignment of the bytes.

Bit	Signification	Remarque
0	under voltage sensor	
1	no voltage sensor	
2	under voltage actuator	
3	no voltage actuator	
4	sensor short circuit at M12	
5	actuator short circuit ³ (shut down)	
6	actuator warning ⁴	
7	Desina diagnosis	
8 ... 31	reserved	

Table 7-12: Description of object 1002H: Manufacturer-Status-Register

7.4.4 Object 1003H: Pre-defined Error Field (PEF)

In this 32-bit "Error memory", the "Error code" is entered in the LSB and "Additional information" in the MSB when an error occurs. The last occurring error is found in sub-index 1. The error that was already present shifts to sub-index 2, the error from sub-index 2 shifts to sub-index 3, and so on.

Errors can only be deleted as a group by writing 0x00 in object 1003,00. Error correction does not delete the error Entry in the PEF.

An emergency telegram (EMCY-telegram) is issued each time an error occurs. When the error has been corrected, an EMCY-telegram with the content NO-ERROR is issued (error-code 0x0000). Error message processing is time offset in order to optimise the internal program run time of the MVK-MC module. An error description consists of two 16-bit fields. The one field contains the error code, the other has the additional information. The structure of entries is shown in Table 7-13 and Table 7-14.

Bit	
MSB	LSB
Additional Information	Error-Code
0000H	0000H

Table 7-13: Structure of pre-defined error field, object 1003H

Index	Sub-index	Error Code	Additional Information	Description
1003	0			Number of errors (8 bit)
	1			Error (32 bit)
	.			
	Max. 10			

Table 7-14: PEF structure, object 1003H

The number of registered errors is found in sub-index 0 of the PEF. The other indices contain the errors as entered in the sequence of their occurrence.

³ only if output paramized

⁴ only if output paramized

7.4.5 Object 1005H: COB-ID SYNC message

The communication parameters for the synchronization telegram are stored in this 32-bit field. The structure is shown in Table 7-15 below.

Bit					
MSB					LSB
31	30	29	28 – 11	10 - 0	
CAN 2.0A: 0/1	0	0	00000000000000000000	11-Bit Identifier	

Table 7-15: Structure of the SYNC COB-ID entry, object 1005H

The significance of individual bits is explained in Table 7-16.

Bit number	Value	Significance	Comments
31 (MSB)	0	Do not care	
30	0	Device creates no sync-objects	
	1	Device creates sync-objects	not supported!
29	0	11-bit ID (CAN 2.0A)	
	1	29-bit ID (CAN 2.0B)	not supported!
28 – 11	0	If bit 29 = 0	
	X	If bit 29 = 1: Bit 28-11 of 29 Bit ID	not supported!
10 - 0 (LSB)	X	Bit 10 - 0 of identifier	

Table 7-16: Description of the SYNC COB-ID entries



The reset value is 80H. This means that the device can receive SYNC-telegrams with COB-ID 80H.

7.4.6 Object 1006H: Communication-Cycle-Period

This object describes the time interval between two SYNC signals in µs. The smallest time unit is 1 ms. This must be kept in mind when selecting SYNC intervals. The entry is made in a 32-bit field. If not used, the field content is zero. If a value between 10 000 and 10 000 000 is listed, the node must receive a SYNC signal within this stated time or the node assumes pre-operational state. The time differential is max. 1 % of the set value. Time monitoring begins with the receipt of the first SYNC signal.

The time limit values are listed in Table 7-17 below:

Object 1006H	Decimal	Hexadecimal	SYNC-interval in ms
Standard value	0	0H	-
Minimum value	10 000	0000 2710H	10
	25 000	0000 61A8H	25
	250 000	0003 D090H	250
	1 000 000	000F 4240H	1 000
	5 000 000	004C 4B40H	5 000
Maximum value	10 000 000	0098 9680H	10 000

Table 7-17: Description of object 1006H: Communication-Cycle-Period

7.4.7 Object 1008H: Manufacturer Device Name (MDN)

With the MDN, device information can be stored in the form of an ASCII string. "MVKMC Dxx8(Dxx8)" has been entered as device identification (x=I or O).

7.4.8 Object 100AH: Manufacturer Software Version (MSV)

The software version is entered as an ASCII string in the MSV. "SWx.xx" is transferred when this object is queried. "SW1.04" stands for software version 1.04.

7.4.9 Object 1010H : Store parameters

With this object some parameters can be save non-volatile (in flash) and recall after power-cycle from non-volatile memory.

Sub Index	PDO-Mapping	Access	Default Value	Description
0	NO	ro	4	Largest sub-index supported
1	NO	rw		Store all parameter
2	NO	rw		Store communication parameter (1000H–1FFFH)
3	NO	rw		Store application parameter (6000H–9FFFH)
4	NO	rw		Store application parameter (2000H–5FFFH)

On reception of the correct signature in the appropriate sub-index the device stores the parameter and then confirms the SDO transmission (initiate download response). If the storing failed, the device responds with an Abort SDO Transfer (abort code:0606 0000h).

Signature ISO 8859 ("ASCII") hex	MSB		LSB	
	e	v	a	s
	65h	76h	61h	73h

If a wrong signature is written, the device refuses to store and responds with Abort SDO Transfer (abort code:0800 002xh).

On read access to the appropriate Sub-Index the device provides information about its storage functionality with the following format:

UNSIGNED32			
bits	MSB	LSB	
	31-2	1	0
	reserved (=0)	0/1	0/1

bit number	value	meaning
31-2	0	reserved (=0)
1	0	Device does not save parameters autonomously
	1	Device saves parameters autonomously
0	0	Device does not save parameters on command
	1	Device saves parameters on command

**Warning!**

During this operation the led's aren't updated, this will take 1 or 2 s.

7.4.10 Object 1011H : Restore default parameters

With this object the default parameters hard coded in firmware can be restore via CAN.

Sub Index	PDO-Mapping	Access	Default Value	Description
0	NO	ro	4	Largest subindex supported
1	NO	rw		Restore all parameter
2	NO	rw		Restore communication parameter (1000H–1FFFH)
3	NO	rw		Restore application parameter (6000H–9FFFH)
4	NO	rw		Restore application parameter (2000H–5FFFH)

On reception of the correct signature in the appropriate sub-index the device restores the default parameters and then confirms the SDO transmission (initiate download response). If the restoring failed, the device responds with an Abort SDO Transfer (abort code:0606 0000h). If a wrong signature is written, the device refuses to restore the defaults and responds with an Abort SDO Transfer (abort code:0800 002xh).

Signature	MSB	LSB		
ASCII	d	a	o	l
hex	64h	61h	6Fh	6Ch

The default values are set valid after the device is reset (reset node for sub-index 1h – 7Fh, reset communication for sub-index 2h) or power cycled.

On read access to the appropriate sub-index the device provides information about its default parameter restoring capability with the following format:

UNSIGNED32		
bits	MSB	LSB
	31-1	0
	reserved (=0)	0/1

bit number	value	meaning
31-1	0	reserved (=0)
0	0	Device does not restore default parameters
	1	Device restores parameters

7.4.11 Object 100CH: Guard-Time und object 100DH: Life-Time-Factor

Description of node and life guarding principle

Object 100CH contains the guard time in milliseconds. Object 100DH contains the lifetime factor. Lifetime is calculated as follows:

$$\text{Lifetime} = \text{Guard time} \times \text{Lifetime factor}$$

If either of these parameters is set to "0" (default setting), there is no monitoring of the master (no life guarding).

For time monitoring to be active, a value of at least 1 must be stated in object 100DH and a time entry (in milliseconds) in object 100CH. To guarantee dependable operation, a minimum Life-Time factor of 2 must be entered, as the node will otherwise switch itself to the "Pre-operational" state without indication of an error. In the event of a delay caused e.g. by a high priority message or internal master node guarding.

When guarding, the master sets remote frames (remote-transmit-request) to the guarding identifiers of the slaves to be monitored. The slaves respond with the guarding message. The message contains the slave status code and a toggle-bit that must change after each message exchange. If the status or toggle-bit do not correspond to the status expected by the NMT master or if no reply is made, the master assumes a slave error.

The slave recognizes the loss of the master when the master requests guarding messages in a strict cyclical form. If the slave, in this case, does not receive a message request (guarding error) from the master within the set "Lifetime", it assumes that the master has failed (Watchdog function). It then sets its outputs to error state and reverts to Pre-operational state. Both of these monitoring mechanisms are particularly important in CANopen, as the modules do not report regularly in the event-controlled mode.



The remote query by the master is answered even without entries in the Guard-Time and Life-Time-Factor objects. Time monitoring is not activated until a value greater than 0 is entered in both objects. A typical guard time value lies somewhere between 250ms and 2 seconds.

Fig. 7-1 shows node guarding and life guarding sequences.

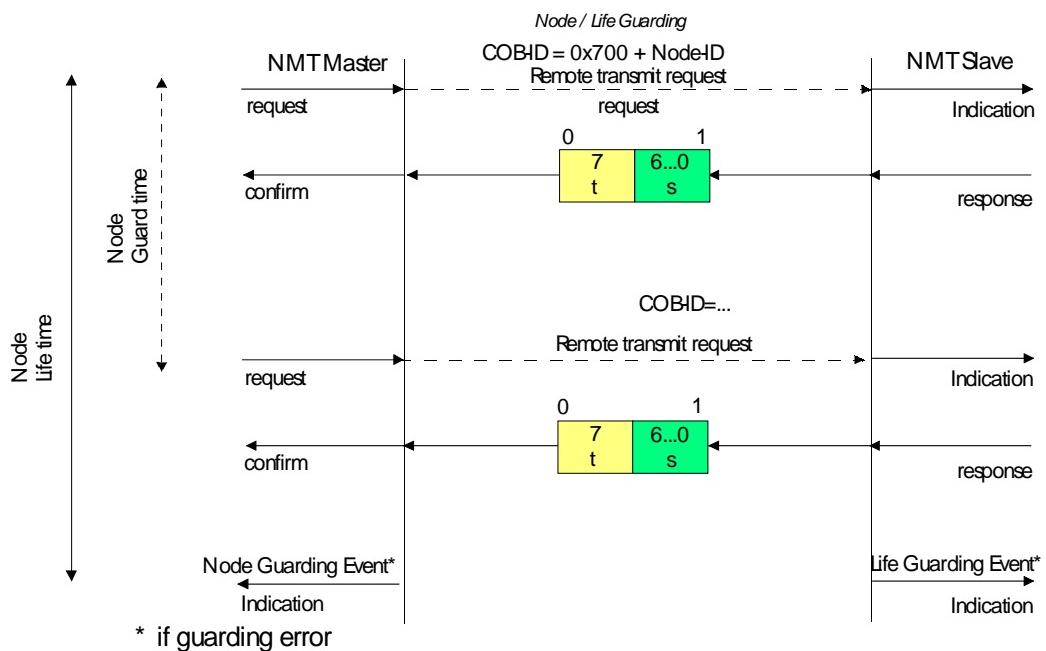


Fig. 7-1: Node and Life Guarding.

Guarding protocol

The toggle bit (t) transferred in the first guarding telegram has the value “0”. Afterward, the bit changes (toggles) in each guarding telegram, thereby signalling if a telegram has been lost. The node indicates its network status (s) in the remaining 7 bits:

Network status	Reply telegram
Stopped	0x04 or 0x84
Pre-operational	0x7F or 0xFF
Operational	0x05 or 0x85

Table 7-18: Network status

Example:

The Guarding message at node 27 (=0x1B) must be queried via a remote frame with the identifier $0x71B = 1819$. When the node is OPERATIONAL, the first data byte of the reply message toggles between 0x05 and 0x85. In PRE-OPERATIONAL state, it changes between 0x7F and 0xFF.

7.4.12 Object 1014H: COB-ID emergency message

The value entered in this object is used as a COB-ID for emergency node messages. When changing the COB-ID, no value may be used that is being used in the node or in the network as a COB-ID for another message. The structure of the EMCY-COB-ID is shown in Table 7-19 below.

Bit					
MSB					LSB
31	30	29	28 - 11	10 - 0	
CAN 2.0A:	0	0	00000000000000000000	11-Bit Identifier	

Table 7-19: Structure of EMCY COB-ID entry, object 1014H

7.4.13 Object 1016H : Consumer Heartbeat Time

The consumer heartbeat time defines the expected heartbeat cycle time and thus has to be higher than the corresponding producer heartbeat time configured on the device producing this heartbeat. Monitoring starts after the reception of the first heartbeat. If the consumer heartbeat time is 0 the corresponding entry is not used. The time has to be a multiple of 1ms.

Sub Index	PDO-Mapping	Access	Default Value	Description
0	NO	ro	01H	
1	NO	rw	0	Consumer heartbeat time

Table 7-20: Consumer Heartbeat Time, object 1016H

At an attempt to configure several consumer heartbeat times unequal 0 for the same Node-ID the device aborts the SDO download with abort code 0604 0043h.

Structure of consumer heartbeat time entry:

UNSIGNED32		
Bits	MSB	LSB
Value	31 – 24	15 - 0
Encoded as	Reserved (value: 00h)	Node-ID
	-	Heartbeat Time
	UNSIGNED8	UNSIGNED16

Table 7-21: Structure of Consumer Heartbeat Time, object 1016H

7.4.14 Object 1017H: Producer Heartbeat Time

The producer heartbeat time defines the cycle time of the heartbeat. The producer heartbeat time is 0 if it not used. The time has to be a multiple of 1ms.

Sub Index	PDO-Mapping	Access	Default Value	Description
0	NO	rw	00H	

Table 7-22: Structure of Producer Heartbeat Time, object 1017H

Heartbeat is generated periodically (the period is Heartbeat Producer Time) by a Node. The heartbeat is send without received a RTR (Remote Transmission Request).

Definition of the boot-up message:

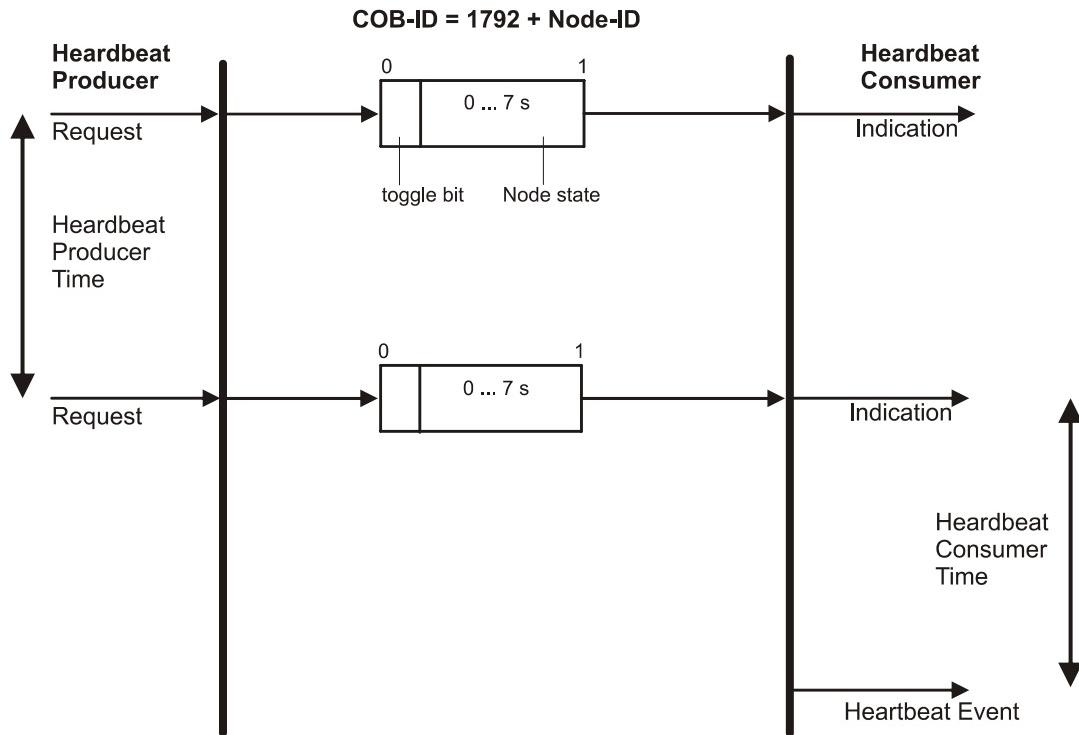


Fig. 7-2: The Heartbeat Time

s: the state of the Heartbeat producer

0:	BOOTUP
4:	STOPPED
5:	OPERATIONAL
127:	PRE-OPERATIONAL

If the Heartbeat Producer Time is configured on a device the Heartbeat Protocol begins immediately. If a device starts with a value for the Heartbeat Producer Time unequal to 0 the Heartbeat Protocol starts on the state transition from INITIALISING to PRE-OPERATIONAL. In this case the Bootup Message is regarded as first heartbeat message. The MSB Value is even zero.

It's not allowed to use Heartbeat and Node-guarding at the same time. If the heartbeat producer time is unequal 0 the heartbeat protocol is used.

7.4.15 Object 1018H: Identity Object

Object 1018H contains general information about the device. The vendor ID (manufacturer Id. No. from CiA) is found in sub-index 1. Sub-index 2 contains the MVK-MC article number. Sub-index 3 contains the revision number divided into main and sub-revision numbers. If CANopen functionality is expanded the main revision number is raised. The sub-revision number is raised during software changes that alter the device functionality but do not affect CANopen functionality.

Please always state the revision number in case of questions concerning the MVK-MC. Sub-index 1 and 2 can be read out to establish the manufacturer and article number.

7.4.15.1 MVK-MC DI8 (DI8), Article No.: 55304

Index	Sub-index	Description	Standard value
1018H	0	Number of entries	3
	1	Vendor ID (32 Bit)	4FH
	2	Product Code (32 Bit)	D8 08H
	3	Revision Number (32 Bit)	00010001H

Table 7-23: Description of object 1018H for a DI8 module

7.4.15.2 MVK-MC DIO8 (DIO8), Article No.: 55305

Index	Sub-index	Description	Standard value
1018H	0	Number of entries	3
	1	Vendor ID (32 Bit)	4FH
	2	Product Code (32 Bit)	D8 09H
	3	Revision Number (32 Bit)	00010001H

Table 7-24: Description of object 1018H for a DIO8 module

7.4.15.3 MVK-MC DIO8 (DIO8), Art.-No.: 55306

Index	Sub-index	Description	Standard value
1018H	0	Number of entries	3
	1	Vendor ID (32 Bit)	4FH
	2	Product Code (32 Bit)	D8 0AH
	3	Revision Number (32 Bit)	00010001H

Table 7-25: Description of object 1018H for a DIO8 module

7.4.16 Object 1200H: Server SDO Parameter

In sub-index 1, this object contains the COB-ID for communication from client to server. Sub-index 2 contains the COB-ID for the opposite direction (see Table 7-26 below).

Index	Sub-index	Description	Standard value
1200H	0	Number of entries	2
	1	Client to Server	600H + Node Id.
	2	Server to Client	580H + Node ID

Table 7-26: Description of object 1200H: Server SDO parameter

7.4.17 Object 1400H and 1405H: Receive PDO Communication parameters

Communication parameters for Receive PDOs are stored in these objects. The parameters are:

- COB-ID of the PDO and
- PDO transmission mode (asynchronous, cyclic synchronous and acyclic synchronous).

COB-ID

Bit					
MSB	30	29	28 – 11	10 - 0	LSB
CAN 2.0A:	0/1	0	0	00000000000000000000	11-Bit Identifier

Table 7-27: Structure of COB-ID entry of the Receive PDO communication parameters

The significance of individual bits is explained in table below.

Bit number	Value	Significance	Comments
31 (MSB)	0	PDO valid	
	1	PDO not valid	
30	0	RTR allowed	
	1	RTR not allowed	
29	0	11-Bit ID (CAN 2.0A)	
	1	29-Bit ID (CAN 2.0B)	not supported!
28 - 11	0	If Bit 29 = 0	
	X	if Bit 29 = 1: Bit 28-11 of 29 Bit ID	not supported!
10 - 0 (LSB)	X	Bit 10 - 0 of the identifier	

Table 7-28: Description of PDO-COB ID entries

Bit 30 describes PDO access possibility via remote frames.



The COB-ID-entries shall only be changed when the PDO is non-active (Bit 31 = 0).

Transmission mode

The PDO transmission mode can be set as shown in following table below. Asynchronous transmission (255) is set as standard for Receive PDOs.

Transfer code	PDO transmission modes					Remark
	Cyclical	Acyclic	Synchronous	Asynchronous	RTR only	
0		X	X			Update data after the Sync- message following the receipt of PDO
1 - 240	X		X			Update data x Sync- message following the receipt of PDO
241 - 251	reserved					
252	reserved					
253	reserved					
254				X		Update data on receipt of PDO (like 255)
255				X		Update data on receipt of PDO

Table 7-29: Description of PDO transmission modes

Under synchronous cyclical transmission, the entry value (1-240) indicates the number of SYNC-objects required for PDO transmission.



Objects 1005H and 1006H must be noted for synchronous mode operation.

7.4.17.1 MVK-MC DI8 (DI8), Article No.: 55304

Table 7-30 shows the exact parameter assignment for the Receive PDOs.

Index	Sub-index	Description	Standard value
1405H	0	Number of entries of the 1st Receive PDO	2
	1	PDO COB-ID (32-bit)	08000300H + Node-ID
	2	Transmission mode (8-bit)	FFH

Table 7-30: Receive PDO communication parameters for a DI8-module



**The MVK-MC-DI8 module supports 1 Receive PDO.
It must be assured that each COB-ID is unique in the entire network unless data is being exchanged between slaves.**

7.4.17.2 MVK-MC DIO8 (DIO8), Article No.: 55305

Table 7-31 shows the exact assignment of parameters for Receive PDOs.

Index	Sub-index	Description	Standard value
1400H	0	Number of entries of the 1st Receive PDO	2
	1	PDO COB-ID (32-bit)	200H + Node Id.
	2	Transmission mode (8-bit)	FFH
1405H	0	Number of entries of the 2nd Receive PDO	2
	1	COB-ID of PDO (32-bit)	08000300H + Node-ID
	2	Transmission mode (8-bit)	FFH

Table 7-31: Receive PDO communication parameters for a DIO8 module



**The MVK-MC-DIO8 module supports two Receive PDOs.
It must be assured that each COB-ID is unique in the entire CANopen network unless data is being exchanged between slaves.**

7.4.17.3 MVK-MC DIO8 (DIO8), Article No.: 55306

Table below shows the exact assignment of parameters for Receive PDOs.

Index	Sub-index	Description	Standard value
1400H	0	Number of entries of the 1st Receive PDO	2
	1	COB-ID of PDO (32-bit)	200H + Node Id.
	2	Transmission mode (8-bit)	FFH
1405H	0	Number of entries of 2nd Receive PDO	2
	1	COB-ID of PDO (32-bit)	08000300H + Node Id.
	2	Transmission mode (8-bit)	FFH

Table 7-32: Receive PDO communication parameters for a DIO8 module



The MVK-MC-DIO8 module supports 2 Receive PDOs.
It must be assured that each COB-ID is unique in the entire CANopen network unless data is being exchanged between slaves.

7.4.18 Object 1600H and 1605H: Receive PDO mapping parameters

This object is used to assign received data to entries in the object directory. The parameters are entered in a sub-index.

The value is entered in a 32-bit field. This field is divided into one 16-bit and two 8-bit areas. The index of the assigned object is found in the 16-bit field. The first 8-bit field carries the sub-index while the second 8-bit field states the length of the assigned entry. Table 7-33 shows the structure.

Bit		
MSB		LSB
Index (16-bit)	Sub-index (8-bit)	Object length (8-bit)
E.g.: 6200H	01H	08H

Table 7-33: Structure of PDO assignment entry

7.4.18.1 **MVK-MC DI8 (DI8), Art.-No.: 55304**

Table 7-34 shows mapping entries for a DI8-module.

Index	Sub-index	Description	Standard value
1605H	0	Number of assigned objects, 1st Receive PDO	1
	1	1 st assigned object, parameter input/diagnostic at Pin2	2000 01 08H

Table 7-34: Receive PDO mapping parameters for a DI8 module

7.4.18.2 **MVK-MC DIO8 (DI8), Article No.: 55305**

Following table shows mapping entries for a DIO8-module.

Index	Sub-index	Description	Standard value
1600H	0	Number of assigned objects, 1st Receive PDO	1
	1	1 st assigned object, digital outputs 0 - 7	6200 01 08H
1605H	0	Number of assigned objects, 2nd Receive PDO	1
	1	1 st assigned object, parameter input/diagnostic at Pin2	2000 01 08H
	2	2 nd assigned object, Functionality input / output pin 4	2001 01 08H

Table 7-35: Receive PDO mapping parameter for a DIO8 module

7.4.18.3 MVK-MC DIO8 (DIO8), Article No.: 55306

Following table shows mapping entries for a DIO16-module.

Index	Sub-index	Description	Standard value
1600H	0	Number of assigned objects, 1st Receive PDO	2
	1	1 st assigned object, digital outputs 0 - 7	6200 01 08H
	2	2 nd assigned object, digital outputs 8 - 15	6200 02 08H
1605H	0	Number of assigned subjects, 2nd Receive PDO	3
	1	1 st assigned object, parameter input/diagnostic at Pin2	2000 01 08H
	2	2 nd assigned object, Functionality input / output pin 4	2001 01 08H
	3	3 rd assigned object, Functionality input / output pin 2	2001 02 08H

Table 7-36: Receive PDO mapping parameters for a DIO8 module

7.4.19 Object 1800H and 1805H: Transmit PDO communication parameters

Communication parameters for Transmit PDOs are stored in these objects. The parameters are:

- COB-ID of the PDO
- PDO transmission mode (asynchronous, cyclic synchronous and acyclic synchronous).
- Inhibit time or an
- Event timer.

COB-ID

Bit				
MSB				LSB
31	30	29	28 – 11	10 - 0
CAN 2.0A: 0/1	0	0	00000000000000000000	11-Bit Identifier

Table 7-37: Structure of COB-ID entry of the Receive PDO communication parameters

The significance of individual bits is explained in table below.

Bit number	Value	Significance	Comments
31 (MSB)	0	PDO valid	
	1	PDO not valid	
30	0	RTR allowed	
	1	RTR not allowed	
29	0	11-Bit ID (CAN 2.0A)	
	1	29-Bit ID (CAN 2.0B)	not supported!
28 - 11	0	If Bit 29 = 0	
	X	if Bit 29 = 1: Bit 28-11 of 29 Bit ID	not supported!
10 - 0 (LSB)	X	Bit 10 - 0 of the identifier	

Table 7-38: Description of PDO-COB ID entries

Bit 30 describes PDO access possibility via remote frames.



The COB-ID-entries can only be changed when the PDO is non-active (Bit 31 = 0).

Transmission mode

The PDO transmission mode can be set as shown in following Table below. Asynchronous transmission (255) is set as standard for Transmit PDOs.

Transfer code	PDO transmission modes					Remark
	Cyclic	Acyclic	Synchronous	Asynchro-nous	RTR only	
0		X	X			Send PDO on next Sync- message after an event or an end of timer
1 - 240	X		X			Send PDO every x Sync- message
241 - 251	reserved					
252			X		X	Send PDO on Remote Request or on next Sync- message
253					X	Send PDO on Remote Request
254				X		Send PDO on event or at end of timer
255				X		Send PDO on event or at end of timer

Table 7-39: Description of PDO transmission modes

Under synchronous cyclical transmission, the entry value (1-240) indicates the number of SYNC-objects required for PDO transmission.



Objects 1005H and 1006H must be noted for synchronous mode operation.

Inhibit Time

In the case of Transmit PDOs, the inhibit time for PDO transmission can be entered in this 16-bit field. After a data change, the transmitter of a PDO checks if the inhibit time has expired since the last transmission. A new PDO transmission can take place only when the inhibit time has elapsed. The inhibit time is useful in asynchronous transmission (transmission mode 255) in order to avoid CAN-Bus overloads. The inhibit time is a multiple of 100µs of object 1800,03/1805,03. The table shows some calculated inhibit times.

Object 1800,03 or 1805,03	Inhibit Time in ms
0000H	0
0064H	10
03E8H	100
1388H	500
2710H	1000
FFFFH	6553

Table 7-40: Inhibit time examples



After a data change, the TxPDO is transmitted again only when the inhibit time has expired, even if synchronous operation is set.

Event Timer

The event timer functions only in asynchronous transmission (transmission mode 255). If data changes before the event timer expires, an interim telegram is sent.

If a value >0 is entered in this 16-bit field, the TxPDO is always transmitted after the event timer expires. The value entered in 1800,05 and 1805,05 is the event timer in ms. Data transfer also takes place without data changes.

object 1800,05 or 1805,05	Event Time in ms
0000h	0
000Ah	10
0064h	100
01F4h	500
03e8h	1000
1388h	5000
2710h	10000

Table 7-41: Event timer examples



The event timer functions only in asynchronous transfer (transmission mode 255).



If inhibit time and event timer are used at the same time, the inhibit time must be smaller than the event time. Otherwise, the event time would expire before the inhibit time and this would make the function illogical.

The Receive PDO communication parameters of the individual MVK-MC modules are listed in the following.

7.4.19.1 MVK-MC DI8 (DI8), Article No.: 55304

Table 7-42 shows the exact assignment of Transmit PDO parameters.

Index	Sub-index	Description	Standard value
1800H	0	Number of entries of 1st Transmit PDO	5
	1	COB-ID of PDO (32-bit)	180H + Node Id..
	2	Transmission mode (8-bit)	FFH
	3	Inhibit time (16-bit)	0000H
	5	Event timer (16-bit)	0000H
1805H	0	Number of entries of 2nd Transmit PDO	5
	1	COB-ID of PDO (32-bit)	80000280H + Node-ID
	2	Transmission mode (8-bit)	FFH
	3	Inhibit time (16-bit)	0000H
	5	Event timer (16-bit)	0000H

Table 7-42: Transmit PDO communication parameters for a DI8 module



**The MVK-MC-DI8 module supports 2 Transmit PDOs.
It must be assured that each COB-ID is unique in the entire CANopen network unless data is being exchanged between slaves**

7.4.19.2 MVK-MC DIO8 (DI8), Article No.: 55305

Table 7-43 shows the exact assignment of parameters for Transmit PDOs.

Index	Sub-index	Description	Standard value
1800H	0	Number of entries of 1st Transmit PDO	5
	1	COB-ID of PDO (32-bit)	180H + Node Id.
	2	Transmission mode (8-bit)	FFH
	3	Inhibit time (16-bit)	0000H
	5	Event timer (16-bit)	0000H
1805H	0	Number of entries of 2nd Transmit PDO	5
	1	COB-ID of PDO (32-bit)	8000 0280H + Node-ID
	2	Transmission mode (8-bit)	FFH
	3	Inhibit time (16-bit)	0000H
	5	Event timer (16-bit)	0000H

Table 7-43: Transmit PDO communication parameters for a DIO8 module



The MVK-MC-DIO8 module supports 2 Transmit PDOs.
It must be assured that each COB-ID is unique in the entire CANopen network unless data is being exchanged between slaves.

7.4.19.3 MVK-MC DIO8 (DIO8), Article No.: 55306

Following table shows the exact assignment of parameters for Transmit PDOs

Index	Sub-index	Description	Standard value
1800H	0	Number of entries of 1st transmission PDO	5
	1	COB-ID of PDO (32-bit)	180H + Node Id.
	2	Transmission mode (8-bit)	FFH
	3	Inhibit time (16-bit)	0000H
	5	Event timer (16-bit)	0000H
1805H	0	Number of entries of 2nd Transmit PDO	5
	1	COB-ID of PDO (32-bit)	80000280H + Node Id.
	2	Transmission mode (8-bit)	FFH
	3	Inhibit time (16-bit)	0000H
	5	Event timer (16-bit)	0000H

Table 7-44: Transmit PDO communication parameters for a DIO8 module



The MVK-MC-DIO8 module supports 2 Transmit PDOs.
It must be assured that each COB-ID is unique in the entire CANopen network unless data is being exchanged between slaves.

7.4.20 Object 1A00H and 1A05H: Transmission PDO mapping parameters

The significance of these objects is analog to objects 1600H and 1605H except that these are Transmit PDOs.

7.4.20.1 MVK-MC DI8 (DI8), Article No.: 55304

Index	Sub-index	Description	Standard value
1A00H	0	Number of assigned objects, 1st Transmit PDO	2
	1	1st assigned object, digital inputs pin 4	6000 01 08H
	2	2nd assigned object, digital inputs pin 2	6000 02 08H
1A05H	0	Number of assigned objects, 2nd Transmit PDO	3
	1	1st assigned object, Common diagnosis	3000 01 08H
	2	2nd assigned object, Sensor short circuit	3000 02 08H
	3	3rd assigned object, Desina inputs	3000 07 08H

Table 7-45: Transmit PDO mapping parameters for a DI8 module

7.4.20.2 MVK-MC DIO8 (DIO8), Article No.: 55305

Index	Sub-index	Description	Standard value
1A00H	0	Number of assigned objects, 1st Transmit PDO	2
	1	1st assigned object, digital inputs pin 4	6000 01 08H
	2	2nd assigned object, digital inputs pin 2	6000 02 08H
1A05H	0	Number of assigned objects, 2nd Transmit PDO	4
	1	1st assigned object, Common diagnosis	3000 01 08H
	2	2nd assigned object, Sensor short circuit	3000 02 08H
	3	3rd assigned object, Desina inputs	3000 07 08H
	4	4th assigned object, Actuator shutdown pin 4	3000 03 08H

Table 7-46: Transmit PDO mapping parameters for a DIO8 module

7.4.20.3 MVK-MC DIO8 (DIO8), Article No.: 55306

Index	Sub-index	Description	Standard value
1A00H	0	Number of assigned objects, 1st Transmit PDO	2
	1	1st assigned object, digital inputs pin 4	6000 01 08H
	2	2nd assigned object, digital inputs pin 2	6000 02 08H
1A05H	0	Number of assigned objects, 2nd Transmit PDO	7
	1	1st assigned object, Common diagnosis	3000 01 08H
	2	2nd assigned object, Sensor short circuit	3000 02 08H
	3	3rd assigned object, Desina inputs	3000 07 08H
	4	4th assigned object, Actuator shutdown pin 4	3000 03 08H
	5	5th assigned object, Actuator warning pin 4	3000 05 08H
	6	6th assigned object, Actuator shutdown pin 2	3000 04 08H
	7	7th assigned object, Actuator warning pin 2	3000 06 08H

Table 7-47: Transmit PDO mapping parameters for a DIO8 module

7.5 Device profile DS-401 V2.0 object description

7.5.1 Processing of I/O data description

All device-supported functions are described in the following according to their entries in the object directory. Only some of the possible device functions as described in device profile DS-401 V2.0 are supported. Input data is processed according to Fig. 7-3, before being filed in the object directory.

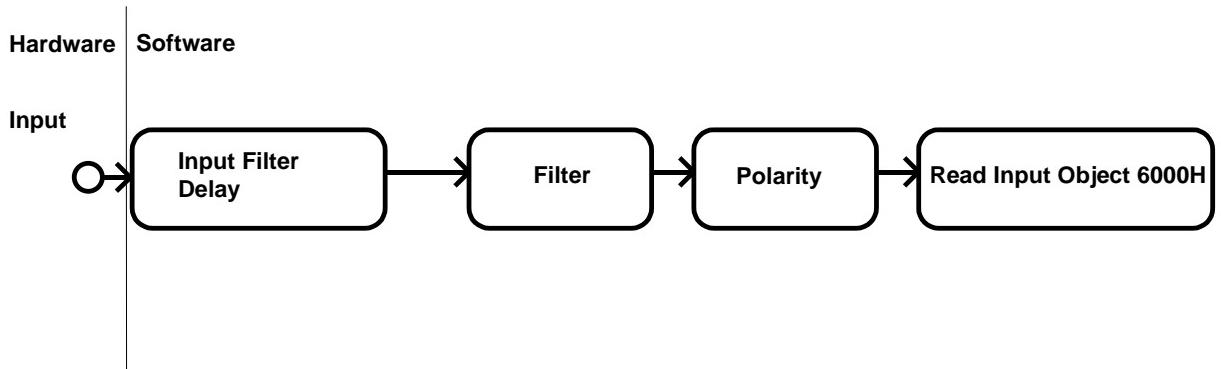


Fig. 7-3: Structure of input data processing

Table 7-48 below shows the processing of input data. The standard setting is highlighted in gray.

Input	Polarity Object 6102H	Filter Object 6103H	Read Input Object 6000H Read Input Object 6100H
0	0	0	0
1	0	0	1
0	1	0	1
1	1	0	0
0	0	1	0
1	0	1	0
0	1	1	0
1	1	1	0

Table 7-48: Input data processing

Output data are processed as shown in Fig. 7-4 before being routed to the outputs. In an error is detected by the MVK-MC module, the outputs are switched according to the defined error values (objects 6206H und 6207H).

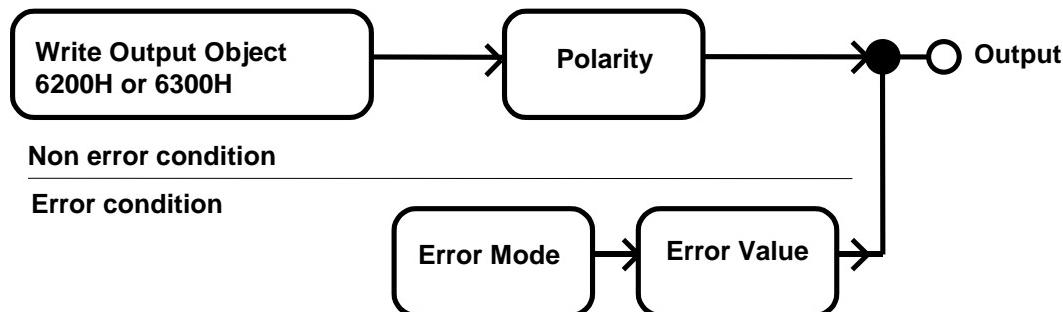


Fig. 7-4: Structure of output data processing

The data flow from the object directory to the outputs is illustrated in Table 7-49 (error-free condition) and Table 7-50 (error condition). The standard settings are highlighted in grey.

Write Output Object 6200H Write Output Object 6300H	Polarity Object 6302H	Filter Object 6308H	Output
0	0	0	0
1	0	0	0
0	1	0	0
1	1	0	0
0	0	1	0
1	0	1	1
0	1	1	1
1	1	1	0

Table 7-49: Output data processing in error-free condition

Write Output object 6200H Write Output object 6300H	Error Mode object 6306H	Error Value object 6307H	Output
0	0	0	0
1	0	0	1
0	1	0	0
1	1	0	0
0	0	1	0
1	0	1	1
0	1	1	1
1	1	1	1

Table 7-50: Output data processing in error condition

7.5.2 Object 6000H: Read Input 8-bit

Reading of an input value with 8 inputs to be stored in one byte. Addressing is effected via index and sub-index, whereby the sub-index 0 contains the number of entries. Table 52 shows the assignment of sub-indices to the inputs.

Sub-index	Bit-No.	Input	Description
1 (Pin 4)	0	Input 00	Status 1 if input 1
	1	Input 01	Status 1 if input 1
	2	Input 02	Status 1 if input 1
	3	Input 03	Status 1 if input 1
	4	Input 04	Status 1 if input 1
	5	Input 05	Status 1 if input 1
	6	Input 06	Status 1 if input 1
	7	Input 07	Status 1 if input 1
2 (Pin 2) Diagnosis input object 2000,01 = 0xFF (Standard setting)	0	Diagnosis 10	Status 1 if diagnosis
	1	Diagnosis 11	Status 1 if diagnosis
	2	Diagnosis 12	Status 1 if diagnosis
	3	Diagnosis 13	Status 1 if diagnosis
	4	Diagnosis 14	Status 1 if diagnosis
	5	Diagnosis 15	Status 1 if diagnosis
	6	Diagnosis 16	Status 1 if diagnosis
	7	Diagnosis 17	Status 1 if diagnosis
2 (Pin 2) Digital input object 2000,01 = 0x00	0	Input 10	Status 1 if input 1
	1	Input 11	Status 1 if input 1
	2	Input 12	Status 1 if input 1
	3	Input 13	Status 1 if input 1
	4	Input 14	Status 1 if input 1
	5	Input 15	Status 1 if input 1
	6	Input 16	Status 1 if input 1
	7	Input 17	Status 1 if input 1

Table 51: Description of object 6000H: Read Input 8-bit

7.5.3 Object 6100H: Read Input 16-bit

Reading of an input value with 16 inputs to be stored in one byte. Addressing is effected via index and sub-index, whereby the sub-index 0 contains the number of entries. Table 52 shows the assignment of sub-indices to the inputs.

Bit-No.	Pin	Input	Description
0	Pin 4	Input 00	Status 1 if input 1
1	Pin 4	Input 01	Status 1 if input 1
2	Pin 4	Input 02	Status 1 if input 1
3	Pin 4	Input 03	Status 1 if input 1
4	Pin 4	Input 04	Status 1 if input 1
5	Pin 4	Input 05	Status 1 if input 1
6	Pin 4	Input 06	Status 1 if input 1
7	Pin 4	Input 07	Status 1 if input 1
8	Pin 2	Input 10 / Diagnosis 10	Status 1 if input 1 / Status 1 if diagnosis
9	Pin 2	Input 11 / Diagnosis 11	Status 1 if input 1 / Status 1 if diagnosis
10	Pin 2	Input 12 / Diagnosis 12	Status 1 if input 1 / Status 1 if diagnosis
11	Pin 2	Input 13 / Diagnosis 13	Status 1 if input 1 / Status 1 if diagnosis
12	Pin 2	Input 14 / Diagnosis 14	Status 1 if input 1 / Status 1 if diagnosis
13	Pin 2	Input 15 / Diagnosis 15	Status 1 if input 1 / Status 1 if diagnosis
14	Pin 2	Input 16 / Diagnosis 16	Status 1 if input 1 / Status 1 if diagnosis
15	Pin 2	Input 17 / Diagnosis 17	Status 1 if input 1 / Status 1 if diagnosis

Table 52: Description of object 6100H: Read Input 16-bit

7.5.4 Object 6102H: Polarity Input 16-bit

Polarity for input values with 16 inputs each. Addressing is effected via index and sub-index, whereby the sub-index 0 contains the number of entries. The polarity of 16 inputs each is influenced from sub-index 1 onward. "0" means that the respective input is accepted in the object directory without any changes. "1" means that the respective input will be accepted as inverted. Table 7-53 shows the assignment of sub-indices to the inputs. For more details see chapter 7.5.1.

Sub-index	Bit-No.	Pin	Input	Standard value	Description
1	0	Pin 4	Input 00	0	Change polarity if entry 1
	1	Pin 4	Input 01	0	Change polarity if entry 1
	2	Pin 4	Input 02	0	Change polarity if entry 1
	3	Pin 4	Input 03	0	Change polarity if entry 1
	4	Pin 4	Input 04	0	Change polarity if entry 1
	5	Pin 4	Input 05	0	Change polarity if entry 1
	6	Pin 4	Input 06	0	Change polarity if entry 1
	7	Pin 4	Input 07	0	Change polarity if entry 1
	8	Pin 2	Input 10 / Diagnosis 10	0	Change polarity if entry 1
	9	Pin 2	Input 11 / Diagnosis 11	0	Change polarity if entry 1
	10	Pin 2	Input 12 / Diagnosis 12	0	Change polarity if entry 1
	11	Pin 2	Input 13 / Diagnosis 13	0	Change polarity if entry 1
	12	Pin 2	Input 14 / Diagnosis 14	0	Change polarity if entry 1
	13	Pin 2	Input 15 / Diagnosis 15	0	Change polarity if entry 1
	14	Pin 2	Input 16 / Diagnosis 16	0	Change polarity if entry 1
	15	Pin 2	Input 17 / Diagnosis 17	0	Change polarity if entry 1

Table 7-53: Description of object 6102H: Polarity input 16-bit



An entry is made in the object directory also when the polarity changes (inverted input value).

7.5.5 Object 6103H: Filter Constant Input 16-bit

Filter for input values with 16 inputs each. Addressing is effected via index and sub-index, whereby sub-index 0 contains the number of entries. Filter masks of 16 inputs each are found from sub-index 1 onward. A "1" means that the respective entry is accepted in the object directory. A "0" means that the entry will not be accepted, whereby a 0 is written in the object directory and no data is sent over the bus. Table 7-54 shows the assignment of sub-indices to the inputs. For more details see chapter 7.5.1.

Sub-index	Bit-No.	Pin	Input	Standard value	Description
1	0	Pin 4	Input 00	1	Accept input if entry 1
	1	Pin 4	Input 01	1	Accept input if entry 1
	2	Pin 4	Input 02	1	Accept input if entry 1
	3	Pin 4	Input 03	1	Accept input if entry 1
	4	Pin 4	Input 04	1	Accept input if entry 1
	5	Pin 4	Input 05	1	Accept input if entry 1
	6	Pin 4	Input 06	1	Accept input if entry 1
	7	Pin 4	Input 07	1	Accept input if entry 1
	8	Pin 2	Input10 / Diagnosis 10	1	Accept input if entry 1
	9	Pin 2	Input11 / Diagnosis 11	1	Accept input if entry 1
	10	Pin 2	Input12 / Diagnosis 12	1	Accept input if entry 1
	11	Pin 2	Input13 / Diagnosis 13	1	Accept input if entry 1
	12	Pin 2	Input14 / Diagnosis 14	1	Accept input if entry 1
	13	Pin 2	Input15 / Diagnosis 15	1	Accept input if entry 1
	14	Pin 2	Input16 / Diagnosis 16	1	Accept input if entry 1
	15	Pin 2	Input17 / Diagnosis 17	1	Accept input if entry 1

Table 7-54: Description of object 6103H: Filter constant input 16-bit



Entry "0" means that no entry is made in the object directory.



When parameterizing filters and polarity, the filters must be set before the polarity.

7.5.6 Object 6200H: Write Output 8-bit

The output values for outputs can only be written byte-wise. Addressing is effected via index and sub-index, whereby sub-index 0 contains the number of entries. Table 7-55 shows the output assignment.

Sub-index	Bit No.	Output	Standard value	Description
1 (Pin 4)	0	Output 00	0	Output 1 if status 1
	1	Output 01	0	Output 1 if status 1
	2	Output 02	0	Output 1 if status 1
	3	Output 03	0	Output 1 if status 1
	4	Output 04	0	Output 1 if status 1
	5	Output 05	0	Output 1 if status 1
	6	Output 06	0	Output 1 if status 1
	7	Output 07	0	Output 1 if status 1

Table 7-55: Description of object 6200H: Write output 8-bit



Outputs can only be written byte-wise.

7.5.7 Object 6300H: Write Output 16-bit

The output values for outputs can only be written byte-wise. Addressing is effected via index and sub-index, whereby sub-index 0 contains the number of entries. Table 7-55 shows the output assignment.

Sub-index	Bit No.	Pin	Output	Standard value	Description
1	0	Pin 4	Output 00	0	Output 1 if status 1
	1	Pin 4	Output 01	0	Output 1 if status 1
	2	Pin 4	Output 02	0	Output 1 if status 1
	3	Pin 4	Output 03	0	Output 1 if status 1
	4	Pin 4	Output 04	0	Output 1 if status 1
	5	Pin 4	Output 05	0	Output 1 if status 1
	6	Pin 4	Output 06	0	Output 1 if status 1
	7	Pin 4	Output 07	0	Output 1 if status 1
	8	Pin 2	Output 10	0	Output 1 if status 1
	9	Pin 2	Output 11	0	Output 1 if status 1
	10	Pin 2	Output 12	0	Output 1 if status 1
	11	Pin 2	Output 13	0	Output 1 if status 1
	12	Pin 2	Output 14	0	Output 1 if status 1
	13	Pin 2	Output 15	0	Output 1 if status 1
	14	Pin 2	Output 16	0	Output 1 if status 1
	15	Pin 2	Output 17	0	Output 1 if status 1

Table 7-56: Description of object 6300H: Write output 16-bit



Outputs can only be written byte-wise.

7.5.8 Object 6302H: Polarity Output 16-bit

Polarity for output values with 16 outputs each. Addressing takes place via index and sub-index, whereby sub-index 0 contains the number of entries. The polarity of 16 outputs each is influenced from sub-index 1 onward. A "0" means that the respective output remains unchanged when issued. A "1" means that the output will be issued inverted. Table below shows the output assignment. For more details see chapter 7.5.1.

Sub-index	Bit No.	Pin	Output	Standard value	Description
1	0	Pin 4	Output 00	0	Change polarity if entry 1
	1	Pin 4	Output 01	0	Change polarity if entry 1
	2	Pin 4	Output 02	0	Change polarity if entry 1
	3	Pin 4	Output 03	0	Change polarity if entry 1
	4	Pin 4	Output 04	0	Change polarity if entry 1
	5	Pin 4	Output 05	0	Change polarity if entry 1
	6	Pin 4	Output 06	0	Change polarity if entry 1
	7	Pin 4	Output 07	0	Change polarity if entry 1
	8	Pin 2	Output 10	0	Change polarity if entry 1
	9	Pin 2	Output 11	0	Change polarity if entry 1
	10	Pin 2	Output 12	0	Change polarity if entry 1
	11	Pin 2	Output 13	0	Change polarity if entry 1
	12	Pin 2	Output 14	0	Change polarity if entry 1
	13	Pin 2	Output 15	0	Change polarity if entry 1
	14	Pin 2	Output 16	0	Change polarity if entry 1
	15	Pin 2	Output 17	0	Change polarity if entry 1

Table 7-57: Description of object 6302H: Polarity output 16-bit

7.5.9 Object 6306H: Error Mode Output 16-bit

If an output is to assume a certain state during an error, this must be entered in this object. In this context, errors refer to SYNC and Guarding errors. If a "1" is entered for the respective output, the output assumes the state defined in object 6307H when an error occurs. If a "0" is entered, the last received output value is retained. Each output corresponds to one bit. Following table shows the output assignment. For more details see chapter 7.5.1.

Sub-index	Bit No.	Pin	Output	Standard value	Description
1	0	Pin 4	Output 00	1	Response of output 00
	1	Pin 4	Output 01	1	Response of output 01
	2	Pin 4	Output 02	1	Response of output 02
	3	Pin 4	Output 03	1	Response of output 03
	4	Pin 4	Output 04	1	Response of output 04
	5	Pin 4	Output 05	1	Response of output 05
	6	Pin 4	Output 06	1	Response of output 06
	7	Pin 4	Output 07	1	Response of output 07
	8	Pin 2	Output 10	1	Response of output 10
	9	Pin 2	Output 11	1	Response of output 11
	10	Pin 2	Output 12	1	Response of output 12
	11	Pin 2	Output 13	1	Response of output 13

Sub-index	Bit No.	Pin	Output	Standard value	Description
	12	Pin 2	Output 14	1	Response of output 14
	13	Pin 2	Output 15	1	Response of output 15
	14	Pin 2	Output 16	1	Response of output 16
	15	Pin 2	Output 17	1	Response of output 17

Table 7-58: Description of object 6306H: Error mode output 16-bit



A “0“ means: Retain the output value in case of an error,
 A “1“ means: Use the output value from object 6307H.
 During SYNC and Guarding errors, the outputs respond as stated in object 6306H.

7.5.10 Object 6307H: Error Value Output 16-bit

Here, one can define the state that the output is to assume if an error arises. If the defined error state was enabled in object 6306H, the output will assume the state defined here. Following table shows the sub-index assignment to the outputs. For more details see chapter 7.5.1.

Sub-index	Bit No.	Pin	Output	Standard value	Description
1	0	Pin 4	Output 00	0	Output status in case of error
	1	Pin 4	Output 01	0	Output status in case of error
	2	Pin 4	Output 02	0	Output status in case of error
	3	Pin 4	Output 03	0	Output status in case of error
	4	Pin 4	Output 04	0	Output status in case of error
	5	Pin 4	Output 05	0	Output status in case of error
	6	Pin 4	Output 06	0	Output status in case of error
	7	Pin 4	Output 07	0	Output status in case of error
	8	Pin 2	Output 10	0	Output status in case of error
	9	Pin 2	Output 11	0	Output status in case of error
	10	Pin 2	Output 12	0	Output status in case of error
	11	Pin 2	Output 13	0	Output status in case of error
	12	Pin 2	Output 14	0	Output status in case of error
	13	Pin 2	Output 15	0	Output status in case of error
	14	Pin 2	Output 16	0	Output status in case of error
	15	Pin 2	Output 17	0	Output status in case of error

Table 7-59: Description of object 6307H: Error value output 16-bit

7.5.11 Object 6308H: Filter constant Output 16-bit

This object defines an additional configurable output filter mask for a group of 16 outputs.
For more details see chapter 7.5.1.

Sub-index	Bit No.	Pin	Output	Standard value	Description
1	0	Pin 4	Output 00	1	Output filter
	1	Pin 4	Output 01	1	Output filter
	2	Pin 4	Output 02	1	Output filter
	3	Pin 4	Output 03	1	Output filter
	4	Pin 4	Output 04	1	Output filter
	5	Pin 4	Output 05	1	Output filter
	6	Pin 4	Output 06	1	Output filter
	7	Pin 4	Output 07	1	Output filter
	8	Pin 2	Output 10	1	Output filter
	9	Pin 2	Output 11	1	Output filter
	10	Pin 2	Output 12	1	Output filter
	11	Pin 2	Output 13	1	Output filter
	12	Pin 2	Output 14	1	Output filter
	13	Pin 2	Output 15	1	Output filter
	14	Pin 2	Output 16	1	Output filter
	15	Pin 2	Output 17	1	Output filter

Table 7-60: Description of object 6308H: Filter constant output 16-bit

7.6 Manufacturer-specific device profile

7.6.1 Object 2000H: Parameter input/diagnosis of pin2

Addressing takes place via index and sub-index, whereby sub-index 0 contains the number of channels. The channel parameters are found from sub-index 1 onward. Upon receipt of parameter information, the current parameter setting is compared with the new data. The MVK-MC module is parametered again if the data had changed.

The MVK-MC can be parametered again and again. Table 7-61 shows the assignment to the M12 sockets.

Sub-index	Bit No.	Status	Test	LED
1	0	1	Pin 2, M12 socket 0: Diagnostic input	Red
		0	Pin 2, M12 socket 0: Digital input	Yellow
	1	1	Pin 2, M12 socket 1: Diagnostic input	Red
		0	Pin 2, M12 socket 1: Digital input	Yellow
	2	1	Pin 2, M12 socket 2: Diagnostic input	Red
		0	Pin 2, M12 socket 2: Digital input	Yellow
	3	1	Pin 2, M12 socket 3: Diagnostic input	Red
		0	Pin 2, M12 socket 3: Digital input	Yellow
	4	1	Pin 2, M12 socket 4: Diagnostic input	Red
		0	Pin 2, M12 socket 4: Digital input	Yellow
	5	1	Pin 2, M12 socket 5: Diagnostic input	Red
		0	Pin 2, M12 socket 5: Digital input	Yellow
	6	1	Pin 2, M12 socket 6: Diagnostic input	Red
		0	Pin 2, M12 socket 6: Digital input	Yellow
	7	1	Pin 2, M12 socket 7: Diagnostic input	Red
		0	Pin 2, M12 socket 7: Digital input	Yellow

Table 7-61: Description of object 2000H: Parameter input/diagnosis of pin 2



Parameterisation of manufacturer-specific device profiles must precede parameter assignment of device profiles.

7.6.2 Object 2001H: Input / Output parameter

This object allows user to configure Pin 2 and Pin 4 as digital input or output in case of configurable module.

The MVK-MC can be parametered again and again. Table 7-61 shows the Sub-index assignment.

Sub-index	Description	Standard value
1	Functionality input / output pin 4	00H
2	Functionality input / output pin 2	00H

Table 7-62: Description of object 2001H: input / output parameter

Status	Description
0	input
1	output



Parameterisation of manufacturer-specific device profiles must precede parameter assignment of device profiles.

7.6.3 Object 3000H: Manufacturer specific diagnosis bytes

This object allow user to know the diagnostic state of each channel.

Sub-index	Description	Standard value
0	Number of entries	07H
1	Common diagnosis (Manufacturer status register, low 8 bit)	80H
2	Sensor short circuit (channel diagnosis)	00H
3	Actuator shutdown pin 4	00H
4	Actuator shutdown pin 2	00H
5	Actuator warning pin 4	00H
6	Actuator warning pin 2	00H
7	Desina inputs	FFH

Table 7-63: Description of object 3000H: Manufacturer specific diagnosis bytes

8 Diagnostics

Diagnostic information is an important basis for easy setup and quick troubleshooting. Errors can be quickly identified through clear information from the I/O module and attached peripheral components such as sensors and actuators to the field bus system. This minimizes downtimes.

8.1 Diagnostics through EMCY telegram

An emergency telegram (EMCY telegram) is always transmitted when an error occurs. When an error has been corrected, an EMCY telegram with NO-ERROR content is transmitted. The EMCY telegram structure is described in greater detail below.

8.1.1 EMCY telegram structure

The EMCY telegram consists of 8 bytes of data. The channel diagnoses are displayed in the manufacturer specific part (Byte 4...7). Fig. 8-1 shows the EMCY telegram structure.

Byte	0-1	2	3-4	5	6	7
CONTENT	Error Code see Following table	Error register object 1001h	reserved	channel diagnosis pin2 (from object 3000h)	channel diagnosis pin4 (from object 3000h)	Manufacturer status register (object 1002h 8 lowest bits)

Table 8-1: Emergency telegram structure

8.1.2 Supported error codes (EMCY Byte 0+1)

The following table lists implemented error codes.

Error code	General field bus diagnostics	Cause
0x0000	ERROR_RESET_OR_NO_ERROR	An error was corrected
0x1000	GENERIC_ERROR	Generic error
0x6101	SOFTWARE_RX_QUEUE_OVERRUN	Internal receiver buffer overflow
0x6102	SOFTWARE_TX_QUEUE_OVERRUN	Internal transmitter buffer overflow
0x8100	COMMUNICATION	Synchronization, transmission/receive error counter ≥ 96
0x8120	CAN_IN_ERROR_PASSIVE_MODE	Can-controller in error passive mode transmission/receive error counter ≥ 128
0x8130	LIFE_GUARD_ERROR	Node-guard-error Heartbeat-error
0x8140	BUS_OFF	Can-controller in bus-off mode transmission error counter ≥ 256
Error code	Device specific diagnostics	Cause
0x2100	CURRENT_DEVICE_INPUT_SIDE	Sensor supply short circuit
0x2320	SHORT_CIRCUIT_AT_OUTPUTS	Actuator short circuit
0x3100	MAINS_VOLTAGE	No voltage at sensor or module $< 12V$
0x3120	INPUT_VOLTAGE_TO_LOW	Under voltage at sensor or module $< 18V$
0x3310	OUTPUT_VOLTAGE_TO_HIGH	Actuator warning
0x3320	OUTPUT_VOLTAGE_TO_LOW	Under voltage actuator supply $< 18V$
0x9000	EXTERNAL_ERROR	Desina diagnosis
0xF000	ADDITIONAL_FUNCTION	No voltage actuator $< 12V$
0xFF00	DEVICE_SPECIFIC_ERROR	Internal communication failed

Table 8-2: Error-Codes

8.1.3 Error-Register (1001H), (EMCY Byte 2)

The error Bits shown in Table 8-3

Bit	Signification	Remark
0	generic error	
1	Current	
2	Voltage	
3	Temperature	
4	communication error	
5	Reserved	
6	Reserved	
7	manufacturer specific	Desina diagnosis

Table 8-3: Error-Register 1001H

8.1.4 Channel-wise - diagnosis (EMCY Byte 5-6)

The data returned in byte 5 and 6 are depending from EMCY byte 7 (manufacturer status register) :

Sensor/actuator no or under voltage :

Byte	5	6	7
CONTENT	00H	00H	0xH

Sensor short circuit :

Byte	5	6	7
CONTENT	sensor short circuit (channel diagnosis) (object 3000 sub-index 2)	sensor short circuit (channel diagnosis) (object 3000 sub-index 2)	10H

Actuator short circuit:

Byte	5	6	7
CONTENT	Actuator shutdown pin4 (channel diagnosis) (object 3000 sub-index 3)	Actuator shutdown pin2 (channel diagnosis) (object 3000 sub-index 3)	20H

Actuator warning:

Byte	5	6	7
CONTENT	Actuator warning pin4 (channel diagnosis) (object 3000 sub-index 5)	Actuator warning pin2 (channel diagnosis) (object 3000 sub-index 6)	40H

Desina diagnosis:

Byte	5	6	7
CONTENT	desina inputs (channel diagnosis) (object 3000 sub-index 7)	desina inputs (channel diagnosis) (object 3000 sub-index 7)	80H

8.1.5 Manufacturer Status Register (EMCY Byte 7)

Following table shows the structure of EMCY byte 7.

Bit	Signification
0	under voltage sensor
1	no voltage sensor
2	under voltage actuator
3	no voltage actuator
4	sensor short circuit at M12
5	actuator short circuit ⁵ (shut down)
6	actuator warning ⁶
7	Desina diagnosis
8 ... 31	reserved

Table 8-4: Manufacturer Status Register (1002H or 3000H Sub-Index)

⁵ only if output paramized

⁶ only if output paramized

8.2 Diagnostics through PDO telegram

If active, the 2nd PDO sends the diagnosis data.

8.2.1 Structure of the 2nd transmit PDO

The 2nd transmit PDO contains 7 Bytes. Table 8-5 shows the structure of the 2nd transmit PDO.

Byte 0	Byte 1	Byte 2	Byte 3	Byte 4	Byte 5	Byte 6
General diagnosis	Channel diagnosis					
Manufacturer status register Object 1002h 8 lowest bit (Object 3000 Sub-index 1)	Sensor supply short circuit (Object 3000 Sub-index 2)	Desina diagnosis (Object 3000 Sub-index 7)	Actuator short circuit Pin 4 (Object 3000 Sub-index 3)	Actuator Warning Pin 4 (Object 3000 Sub-index 5)	Actuator short circuit Pin 2 (Object 3000 Sub-index 4)	Actuator Warning Pin 2 (Object 3000 Sub-index 6)

Table 8-5 : Structure of the 2nd transmit PDO

8.3 Diagnostic displays

All modules of the MVK-MC series have separate and clearly arranged displays for bus status, device status and I/O status. These displays are located on the front of the device. The EMCY telegram structure is described in greater detail in the sections below.

8.3.1 I/O status LEDs at the M12 sockets

Each input and output is allocated a separate status display which is labeled '00...07'. These displays are located next to the corresponding M12 socket; this makes it easy to identify the status of peripheral components such as sensors and actuators.

Each M12 socket is assigned a second LED which, depending on how the input was parameterized, displays the diagnosis status (red illuminated, default) or the additional function input status (yellow illuminated). These displays can also be configured as output via the 2001H object. There are labeled "10...17".



Fig. 8-1: I/O status LEDs at the M12 sockets

Following table shows a functions overview of the LEDs at the M12 sockets.

Pin	Pin function	LED-Status	Description
2	Diagnosis input object 2000,01h = 0xFF object 2001,02h = 0x00 (Standard setting) LED 10...17	Red	If no signal at Pin 2
		Off	If there is a signal at Pin 2
	Digital input object 2000,01h = 0x00 object 2001,02h = 0x00 LED 10...17	Yellow	If there is a signal at Pin 2
		Red	In case of sensor supply short circuit
		Off	If no signal at Pin 2
	Digital output object 2001,02h = 0xFF LED 10...17	Yellow	If output activated (signal at Pin 2)
		Red	In case of sensor supply short circuit
		Off	If output not activated (no signal at Pin 2)
4	Digital input object 2001,01h = 0x00 LED 00...07	Yellow	If there is a signal at Pin 4
		Red	In case of sensor supply short circuit
		Off	If no signal at Pin 4
	Digital output object 2001,01h = 0xFF LED 00...07	Yellow	If output activated (signal at Pin 4)
		Off	If output not activated (no signal at Pin 4)

Table 8-6: Function of LEDs at the M12 sockets

8.3.2 Bus and device status LEDs on the module

The LED's on the face of the module are clearly marked for identification. Display is achieved through static illumination or flashing of the LED's. Following table shows the location of the LEDs.

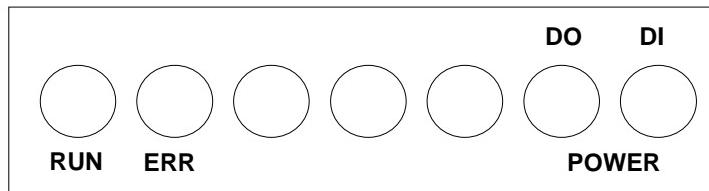


Fig. 8-2: Bus and device status LEDs on the module face

The LED display for the bus communication corresponds to the standard DRP303-3.

Name	LED	STATE	Description
ERROR (red)	Off	no error	The Device is in working condition
	Single flash	Warning limit reached	At least one of the error counters of the CAN controller has reached or exceeded the warning level (too many error frames)
	Flickering	AutoBaud	Auto Baud rate detection in progress (Alternately flickering with RUN led)
	Double flash	Error Control Event	A guard event (NMT-Slave or NMT-master) or a heartbeat event (heartbeat consumer) has occurred
	Triple flash	Sync error	The SYNC message has not been received within the configured communication cycle period time out
RUN (green)	On	Bus Off	The CAN controller is bus off
	Flickering	AutoBaud	Auto Baud rate detection in progress (Alternately flickering with ERROR led)
	Single flash	STOPPED	The device is in STOPPED state
	Blinking	Pre-Operational	The device is in PRE-OPERATIONAL state
DI POWER	On	Operational	The device is in OPERATIONAL state
	Off	No voltage	Sensor and module supply not available
	Green	Normal function	Sensor and module supply OK
DO POWER	Red	Undervoltage	Undervoltage, sensor and module power supply
	Off	No voltage	Actuator supply not available
	Green	Normal function	Actuator supply OK
	Red	Undervoltage	Undervoltage, Actuator power supply

Table 8-7: Function of bus and device status LEDs at the device

The following Indicator states are distinguished:

- LED on constantly on
- LED off constantly off
- LED flickering iso-phase on and off with a frequency of approximately 10 Hz: on for approximately 50 ms and off for approximately 50 ms.
- LED blinking iso-phase on and off with a frequency of approximately 2,5 Hz: on for approximately 200 ms followed by off for approximately 200 ms.
- LED single flash one short flash (approximately 200ms) followed by a long off phase (approximately 1000 ms).
- LED double flash a sequence of two short flashes (approximately 200ms), separated by an off phase (approximately 200ms). The sequence is finished by a long off phase (approximately 1000 ms).
- LED triple flash a sequence of three short flashes (approximately 200ms), separated by an off phase (approximately 200ms). The sequence is finished by a long off phase (approximately 1000 ms).

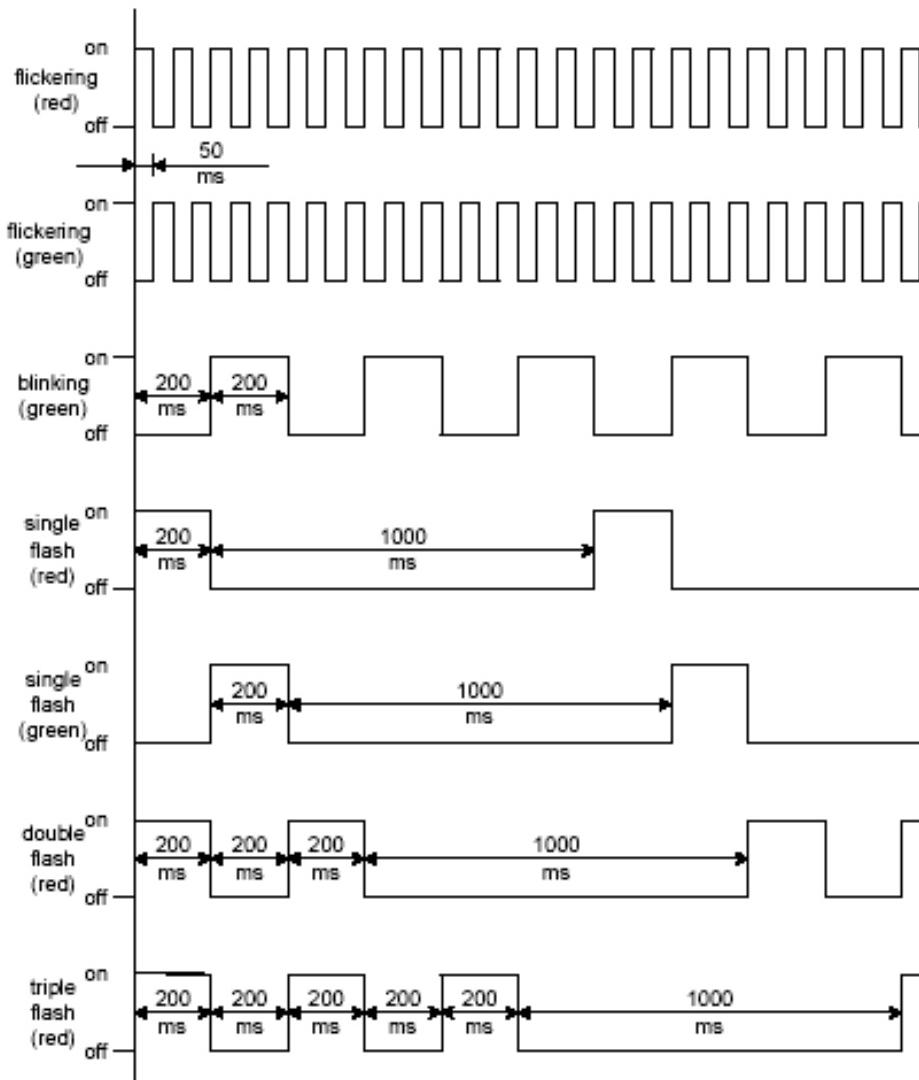


Fig. 8-3: Indicator states and flash rates

8.4 Sensor supply

Power supply for the sensors is provided at the M12 sockets between pin 1 (+24V) and Pin 3 (0V). This power supply is also available on the output modules because the diagnostic input can be configured as a function input via parameter.

8.4.1 Short circuit or overload

During a short circuit or overload of the sensor supply, the following symptoms are observed at the MVK-MC module:

- the diagnosis LED at the corresponding M12 socket lights red,
- the respective diagnosis data are sent across the bus to the master.
- All other inputs still works correctly.

When an overload or short circuit has been corrected or the sensor supply connected, the LED's and diagnosis data are reset.

8.4.2 Undervoltage / no voltage

There are two levels of undervoltage detection :

- $U_s < 18 \text{ V}$: In this case the module is still working but :
 - the POWER-DI LED lights red,
 - the respective diagnosis data is sent across the bus to the master.
- $U_s < 12 \text{ V}$: In this case the I/O doesn't work anymore but the bus communication still works :
 - the POWER-DI LED goes off,
 - the respective diagnosis data is sent across the bus to the master.
- $U_s < 7 \text{ V}$: in this case the module shutdown

8.5 Actuators

8.5.1 Short circuit or overload

During a short circuit or overload of an output, the following symptoms are observed at the MVK-MC:

- The diagnosis LED at the corresponding M12 socket also lights red,
- The output status LED extinguishes,
- The respective diagnosis data are transferred across the bus to the master.

In order to reactivate an output after a short circuit or overload has been corrected, the following procedure must be observed:

1. The output must first be set to "0"
2. and then to "1" again.

The LEDs '01...07' at the M12 sockets indicate the status of the respective outputs.

8.5.2 Undervoltage

There are two levels of undervoltage detection :

- $U_a < 18 \text{ V}$: In this case the module is still working but :
 - the POWER-DO LED lights red,
 - the respective diagnosis data is sent across the bus to the master.
- $U_a < 12 \text{ V}$: In this case, inputs and bus communication still works :
 - the POWER-DO LED goes off,
 - all outputs are set to 0,
 - the respective diagnosis data is sent across the bus to the master.

9 Data sheets

9.1 EMC noise immunity specifications for MVK-MC modules

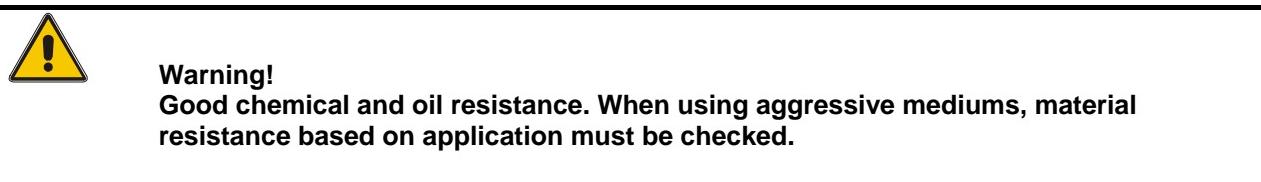
EN 61000-4-3 RF-Field	10 V/m
ENV 50204 RF-Field GSM	10 V/m
EN 61000-4-4 Burst	± 2 kV
EN 61000-4-5 SURGE	Asymmetric/sym. ± 500 V Asymmetric ± 1 kV
EN 61000-4-6 RF-asymmetric	10 V
EN 61000-4-8 Magnetic field 50 Hz	30 A/m
EN 50081-1 Interference field strength	QP 30 dB μ V/m (30 - 230 MHz) QP 37 dB μ V/m (230 - 1000 MHz)
Insulation DIN VDE 0160	Full compliance

9.2 Technical data

9.2.1 General information on MVK-MC modules

Ambient conditions

Operating temperature 0°C ... +55°C
Storage temperature -25°C ... +70°C
Enclosure type according to DIN 40050, IEC 529 IP 67



Mechanical ambient conditions

Oscillation according to DIN EN 60068-2-6 10 – 58 Hz; const. amplitude 0.35 mm
58 – 150 Hz; const. acceleration 5 g
Shock according to DIN EN 680068-2-27 Amplitude 30 g, 11 ms duration

Bus data

Transfer protocol CANopen according to CiA DS-301 V4.01
Type of device Generic I/O module, Device profile DS401V2.0
Data rates 10/20/50/100/125/250/500/800/1000 kBit/s
..... Automatic recognition
Electrical isolation 500V between bus and internal logic with
..... opto-coupler and DC/DC converter
Operating modes Cyclic and acyclic synchronous PDOs,
..... Asynchronous PDOs
Addressing 1 to 99 selectable with two rotary switches
CiA e.V. Vendor Id 79_{Dez}, 4FH

Connection possibilities

Function and diagnosis inputs, and outputs 8 x 5-pin M12 socket
CAN-Bus connection 5-pin (7/8") Mini style connector
Supply 4-pin (7/8") Mini style connector

Miscellaneous

Dimensions (LxWxH) in mm 220 x 63 x 48
Mounting dimensions in mm 208.5±0.5
Weight approx. 735 g

9.3 Product-specific data

9.3.1 MVK-MC DI8 (DI8), Article No.: 55304

Power supply

Module and sensor supply (rated voltage)	24 V DC (must always be connected)
Operating voltage range	18 ... 30 V DC
Total module current load (power plug)	8 A
Current consumption (without sensor supply)	approx. 80 mA
Sensor supply	Max. 200 mA for each M12 socket
Short circuit protection for sensors	Multi-fuse, Up to 100 mA load automatic from 100 mA, a reset must follow
Multi fuse reaction time (time to trip)	1s at $I_K \geq 1$ A und 23°C ambient temperature
Core cross section	max. 1.5 mm ²
Reverse polarity protection, inputs	Yes

Bus data

Communication objects	2 TxPDOs, 1 RxPDO
.....	1 SDO
.....	1 Emergency-object

Function inputs

Number	8
Input filter delay time	Approx. 1 ms
Input characteristics	IEC 1131-2, Type 2
Delay time for signal change	Approx. 3ms

Diagnosis inputs/Function inputs (can be individually parameterized)

Number	8
Input filter delay time	Approx. 1 ms
Input characteristic	IEC 1131-2, type 2
Delay time for signal change	Approx. 3ms

9.3.2 MVK-MC DIO8 (DI8), Article No.: 55305

Power supply

Module, sensor and actuator supply M12 socket 0 to 3 (rated voltage).....	24 V DC (must always be connected)
Actuator supply M12 socket 4 to 7 (rated voltage)	24 V DC
Operating voltage range	18 ... 30 V DC
Total current load of module (power plug).....	8 A
Current consumption (without sensor supply)	Approx. 80 mA
Sensor supply	Max. 200 mA at each M12 socket
Short circuit protection for sensors	Multi-fuse, Up to 100 mA load automatic from 100 mA load, a reset must follow
Multi-fuse reaction time (Time to trip)	1s at $I_K \geq 1$ A und 23°C ambient temperature.
Core cross section	max. 1.5 mm ²
Reverse polarity protection, inputs	Yes
Reverse polarity protection, outputs	Yes

Bus data

Communication objects	2 TxPDOs, 2 RxPDOs
.....	1 SDO
.....	1 Emergency object

Functions inputs (can be individually parameterized)

Number	max. 8
Input filter delay time.....	Approx. 1 ms
Input characteristics	IEC 1131-2, Type 2
Delay time for signal change	Approx. 3ms

Outputs (can be individually parameterized)

Number	max. 8
Actuator current load	Max. 1.6 A per actuator ($\Sigma =$ max. 8A)
Cable length.....	With 0.75-mm ² max. 10 m With 0.34-mm ² max. 5 m
Core cross section	Max. 1.5 mm ²
Max. cycle frequency	20 Hz

Diagnosis inputs / Function inputs (can be individually parameterized)

Number	8
Input filter delay time.....	Approx. 1 ms
Input characteristic	IEC 1131-2, type 2
Delay time for signal change	Approx. 3ms

9.3.3 MVK-MC DIO8(DIO8), Article No.: 55306

Power supply

Module and sensor supply (rated voltage)	24 V DC (must always be connected)
Actuator supply M12 sockets 4 to 7 (rated voltage)	24 V DC
Operating voltage range	18 ... 30 V DC
Total current load of module (power plug)	8 A
Current consumption (without sensor supply)	Approx. 80 mA
Sensor supply	Max. 200 mA at each M12 socket
Short circuit protection for sensors	Multi-fuse,Up to 100 mA load automaticFrom 100 mA load, a reset must follow
Multi-fuse reaction time (Time to trip)	1s at $I_K \geq 1$ A und 23°C ambient temperature
Core cross section	max. 1.5 mm ²
Reverse polarity protection, inputs	Yes
Reverse polarity protection, outputs	Yes

Bus data

Communication objects	2 TxPDOs, 2 RxPDOs
.....	1 SDO
.....	1 Emergency-object

Functions inputs (can be individually parameterized)

Number	max. 16
Input filter delay time	Approx. 1 ms
Input characteristics	IEC 1131-2, Type 2
Delay time for signal change	Approx. 3ms

Outputs (can be individually parameterized)

Number	max. 16
Actuator current load	Max. 1.6 A per actuator ($\Sigma =$ max. 8A)
Cable length	With 0.75-mm ² max. 10 mWith 0.34-mm ² max. 5 m
Core cross section	Max. 1.5 mm ²
Max. cycle frequency	20 Hz

Diagnosis inputs (can be individually parameterized)

Number	max. 8
Input filter delay time	Approx. 1 ms
Input characteristic	IEC 1131-2, type 2
Delay time for signal change	Approx. 3ms

10 Accessories

10.1 General accessories

Blind caps

Art. No.	Packaging unit	Designation
338008		M12 diagnosis adapter (line monitoring to straps)
55 468	(4 pcs)	M12 blind cap black
338155	1 piece	M12x1 diagnosis blind cap

Self-connecting connectors

Art. No.	Designation
27626	CANopen Bus M12 plug A-encoded straight type
27621	CANopen Bus M12 socket A-encoded straight type
55774	CANopen cable (per metre)
27663	Power 7/8" plug straight type
27661	Power 7/8" socket straigth type

Power T-piece 7/8"

Assignment	Art. No.	Remark
	14881	Plug-Socket-Socket

Desina®-Sensor

- Nominal operating distance : 2 mm flush (protected 0 to 1,6 mm)
- Operating voltage : 10 to 30 V DC
- Current carrying capacity : 200 mA
- Short-circuit-proof and polarity protected
- Switching frequency : 800 Hz

Art. No.	Designation
17259	M12 x 1 Desina®-Sensor

Valve connector type A

- Contact gap 18 mm
- Operating voltage 24 V AC/DC, pressure switch 24 V DC
- Max. operating current max. 4 A

Art. No.	Outgoing direction	Remark
3513850	M12 connection upwards	Yellow LED, protective circuit for valves
3513858		Yellow/green LED for pushbutton
3513855	M12 connection to the rear	Yellow LED, protective circuit for valves
3513859		Yellow/green LED for pushbutton

Art.No.	Designation
55 319	Terminating plug connector

Valve connector combination type A

- Contact gap 18 mm
- Operating voltage 24 V AC/DC
- Max. operating current 4 A

Art. No.	Outgoing direction	Length of cable
3611130		100 mm
3611150	M12 connection upwards	150 mm
3611170		200 mm
3613130		100 mm
3613150	M12 connection to the rear	150 mm
3613170		200 mm

Other system accessories on request

10.2 Cables

CANopen			7/8“ power cable		
Plug-Socket straight type-straight type	Art. No.	Length	Socket straight type	Art. No.	Length
	42 34 520	0,3 m			
	42 34 521	0,6 m			
	42 34 522	1,0 m		14 558	1,5 m
	42 34 523	2,0 m			
				14 559	3,0 m
	42 34 524	3,0 m			
				14 562	5,0 m
				14 563	10,0 m
	42 34 525	5,0 m			

CANopen			7/8“ power cable		
Plug-socket angle type-angle type	Art. No.	Length	Socket straight type	Art. No.	Length
	42 34 670	0,3 m		14 624	0,3 m
	42 34 671	0,6 m		14 625	0,6 m
	42 34 672	1,0 m		14 626	1,0 m
				14 628	2,0 m
	42 34 673	2,0 m			
	42 34 674	3,0 m			
	42 34 675	5,0 m			

11 Abbreviations

CAL

CAN Application Layer: User layer (ISO/OSI layer 7) specified by the CiA.

CAN

Controller area network.

CiA

CAN in Automation e. V.: "Organization of CAN-Bus device manufacturers and users".

CiA Draft Standard 102

Description of physical CAN communication (layer 2) for industrial application.

CiA Draft Standard 302

Description of communications profile for industrial systems.

CMS

CAN based message specification: A service element available to the application layer for the manipulation of objects.

COB

Communication object: Messages are transmitted in the network in COBs and viewed as communication objects.

COB-ID

COB-Identifier: Each communication object is unambiguously defined by the COB-ID. The COB-ID marks the communication object's priority.

CSMA/CA

Carrier Sense Multiple Access / Collision Avoidance

DBT

COB-ID distributor: A service element of the application layer; it assigns the COB-IDs to the communication objects of the CMS services.

DI

Digital Input

DIN

Deutsches Institut für Normung: German standards institute.

DO

Digital Output

EN

Europäische Norm: (European standard).

EWG (EEC)

Europäische Wirtschaftsgemeinschaft: European economic community

IEC

International electro-technical commission.

ISO

International standard organization.

LED

Light emitting diode.

LMT

Layer Management: Enables the setting of layer-related parameters to a node.

MVK

Murrelektronik compact sized distributor.

NMT

Network Management: NMT provides services for initialising and monitoring the nodes in a network.

MNS

Module network status.

OSI

Open Systems Interconnection.

PDO

Process Data object: Object for process data exchange between various devices.

RTR

Remote transmission request: Request for data (telegram) with the same identifier used for data transmission.

SDO

Service Data object: Objects for communication during configuration and when accessing entries in the object directory.

SPS

Speicher-programmierbare Steuerung: (PLC: Programmable logic control).

SYNC

Synchronization object.

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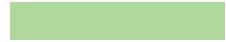
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